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Demonstration of a Public-Private Regional Solid-Waste Management System in KY Bluegrass Area Development District

Spindletop Research, Inc, Lexington, Ky

Prepared for

Environmental Protection Agency, Cincinnati, Ohio Office of Solid Waste Management Programs

31 Jan 71

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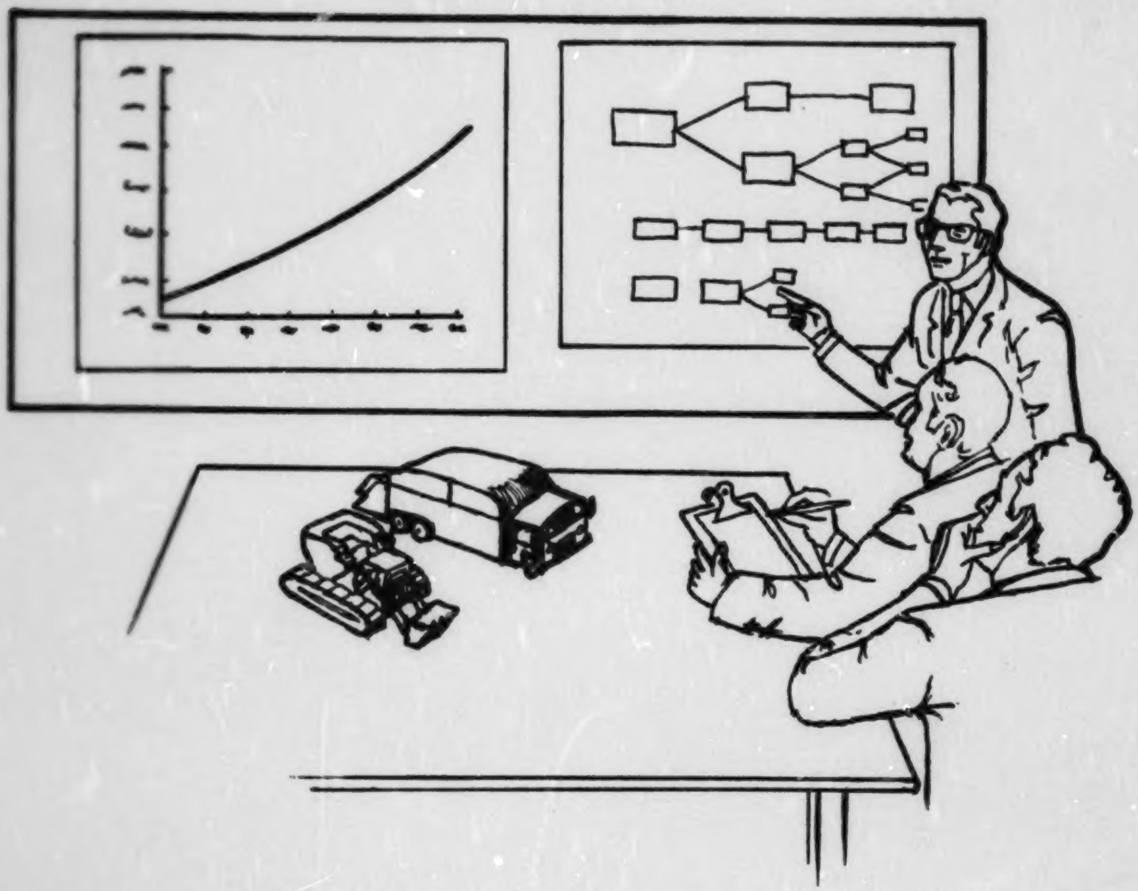
SOLID WASTE Management Program for the Bluegrass ADD



SPINDLETOP RESEARCH

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This document describes the work performed in identifying the major problems surrounding solid waste disposal in the 17-county Bluegrass District of Kentucky and in designing a technical and management system to resolve these problems. It describes the efforts that were required to demonstrate to public officials and civic groups the advantages of a multi-jurisdictional approach. Also, it includes a description of the Bluegrass Solid Waste Disposal Corporation, possible sources of financing and, most importantly, a status report on the implementation phase already underway.

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COMPREHENSIVE REPORT
DEMONSTRATION OF A PUBLIC-PRIVATE REGIONAL SOLID-WASTE MANAGEMENT SYSTEM IN KENTUCKY'S BLUEGRASS AREA DEVELOPMENT DISTRICT

Submitted to:

Office of Solid Waste Management Programs
Environmental Protection Agency
Cincinnati, Ohio

This solid-waste disposal demonstration project was supported in part by a grant (G06-EC-00268) from the Environmental Protection Agency, by a grant from the Kentucky Program Development Office, and by a grant from Spindletop Research, Inc.

January 31, 1971

SPINDLETOP RESEARCH
P.O.BOX 481 • IRON WORKS ROAD • LEXINGTON, KENTUCKY 40501

EXECUTIVE SUMMARY

The disposal of solid waste in the 17-county Bluegrass Area Development District of Kentucky is becoming a critical problem. The 46 jurisdictions in the District have spawned 32 disposal sites, of which 75 percent are operated without state permits. And, this number does not take into account the innumerable roadside dumps.

Recognizing the seriousness of this problem, the Fayette County Judge, in July 1969, called a meeting of mayors and county judges in the District to devise a plan of action. The meeting was held at Spindletop Research, Inc., a not-for-profit applied research organization located just outside Lexington in Fayette County. As a result of this meeting, a plan was formulated whereby Spindletop would submit an application for demonstration and operational funds to the Bureau of Solid Waste Management of the U.S. Department of Health, Education and Welfare (HEW). With federal assistance and technical and management expertise available through Spindletop, an action program would then be initiated to help resolve the problem.

The salient feature of the demonstration was the proposed management system. Since the solid waste problem is a critical concern to both public and private sectors of society, the concept behind the demonstration was to determine whether an organization could be designed and operated under control of both sectors. A successful demonstration would produce a model for replication elsewhere in the United States.

After the grant application was modified to meet requirements of the Solid Waste Disposal Act of 1965, it was approved and set forth three tasks: (1) to design a solid waste disposal system to serve the 17 counties; (2) to design and organize a public-private, nonprofit corporation to operate the system; and (3) to identify sources of funds that would be essential for implementing the system.

This document describes the work performed in identifying the major problems surrounding solid waste disposal in the 17-county Bluegrass District and in designing a technical and management system to resolve these problems. It describes the efforts that were required to demonstrate to public officials and civic groups the advantages of a multi-jurisdictional approach. Also, it includes a description of the Bluegrass Solid Waste Disposal Corporation, possible sources of financing and, most importantly, a status report on the implementation phase already underway.

In designing a solid waste disposal system for the Bluegrass District, Spindletop used a systems approach which included:

- Evaluating solid waste disposal practices;
- Determining types and quantities of solid waste generated within the District; and
- Determining the number and location of sanitary landfills needed to serve the residents of the District.

In designing the management system, inputs from public officials were used to insure that the system would satisfy the needs of jurisdictions. From these inputs, the articles of incorporation, bylaws for the nonprofit corporation, and the organization and operating programs of the management system were designed.

Next, various sources and methods of financing were evaluated. Local governmental entities were considered. The sources of leasing of land and equipment were identified, as well as potential

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sources of borrowed funds. The feasibility of bonded indebtedness was also investigated. The various assistance programs of Farmers Home Administration, Environmental Protection Agency, Small Business Administration, and Economic Devleopment Administration were investigated.

The solid waste disposal system for the District will consist of seven sanitary landfills strategically placed to handle the major volumes of solid waste. The system is to be managed by the Bluegrass Solid Waste Disposal Corporation, which is governed by representatives of jurisdictions, individual users and private haulers. However, during the course of the project, it became apparent that it would be neither practical nor desirable to implement simultaneously a disposal system consisting of seven landfills. For one thing, certain jurisdictions had more critical problems than others. Some were more willing to cooperate than others. Also, the principles of sanitary landfill operations were difficult to convey to many of the leaders in decision-making positions because there was no properly operated sanitary landfill in the District.

As a result, Spindletop recommended that phased implementation of the sanitary landfill system begin in the northeast section of the District since six of eight jurisdictions located there showed a unified interest in the Corporation. Bourbon, Harrison and Nicholas Counties comprise the segment. This phased implementation coincided with Spindletop's recommendation that each sanitary landfill be financed separately to take advantage of local opportunities.

By phasing the implementation of a 17-county system, two immediate benefits will result:

- Logistical problems will be reduced substantially and
- The existence of a permitted and properly operated sanitary landfill in the three-county area will act as a catalyst for encouraging other areas to initiate similar operations.

As of January 31, 1971, 19 out of the 46 jurisdictions in the Bluegrass District have submitted Letters of Intent to participate in the proposed system.

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I. INTRODUCTION

BACKGROUND

The disposal of solid waste is an ever increasing problem facing each jurisdiction in the Bluegrass area of Kentucky.* The amount of refuse and the cost of disposal of this refuse are increasing each year. To complicate the problem, incinerators in various cities cannot handle the waste generated within the cities, much less the waste generated outside the cities. Beyond this, disposal techniques are becoming more complex as technological advancements change the characteristics of solid waste. And if procedures are not properly followed, the techniques can contribute to the pollution of the air, water, and land.

Recognizing the seriousness of the problem, the Fayette County Judge, in July 1969, called a meeting of mayors and county judges of the 17-county Bluegrass region, shown in Figure 1, to develop a plan of action.† Nine county judges, 12 mayors, representatives of state government, private contractors and health planning council attended the meeting. At the meeting, the officials agreed to a regional approach consisting of a solid waste management system tailored to the needs of the district.

SPINDLETOP'S ROLE

In August 1969, Spindletop Research, Inc., a not-for-profit research organization, submitted an application for a grant to the Bureau of Solid Waste Management of the U.S. Department of Health, Education and Welfare (HEW). ‡ The application requested funds not only for designing a management system and collection and disposal systems for urban and rural areas, but also funds for procuring the necessary land, equipment, facilities and personnel to operate the system.

In January, 1970, HEW approved the grant after the application had been modified to meet requirements of the Solid Waste Disposal Act of 1965. The grant, with its new scope of work, set forth three major tasks.

- To design a solid waste disposal system to serve the Bluegrass Area Development District,§
- To design and organize a nonprofit corporation that would operate the multi-jurisdictional solid waste disposal system; and
- To identify sources of finance for the system and develop a plan to utilize these finances.

This document describes the work performed by Spindletop to accomplish the tasks and discusses the decisions that were made and the rationale for these decisions. It covers the solid waste problem in the Bluegrass area, Spindletop's approach to the problem, trials and tribulations of solving the problem, and finally the proposed solution to the problem.

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*Kentucky Revised Statute Chapter 211 defines solid waste as ". . . all putrescible and nonputrescible refuse in solid form. Solid waste includes but is not limited to garbage, rubbish, ashes, incinerator residue, street refuse, dead animals, demolition wastes, construction wastes, solid commercial and industrial wastes and radioactive materials."

†The County Judge is the chief elected official of the county and the presiding officer of the county fiscal court. He also has various judicial powers.

‡The Bureau of Solid Waste Management was transferred to the Environmental Protection Agency during the course of the demonstration.

§Area Development Districts (ADD's) are keystones of the overall development program in Kentucky. They are designed to enhance the development opportunities in an area by organizing the whole range of federal and state programs that affect the districts.

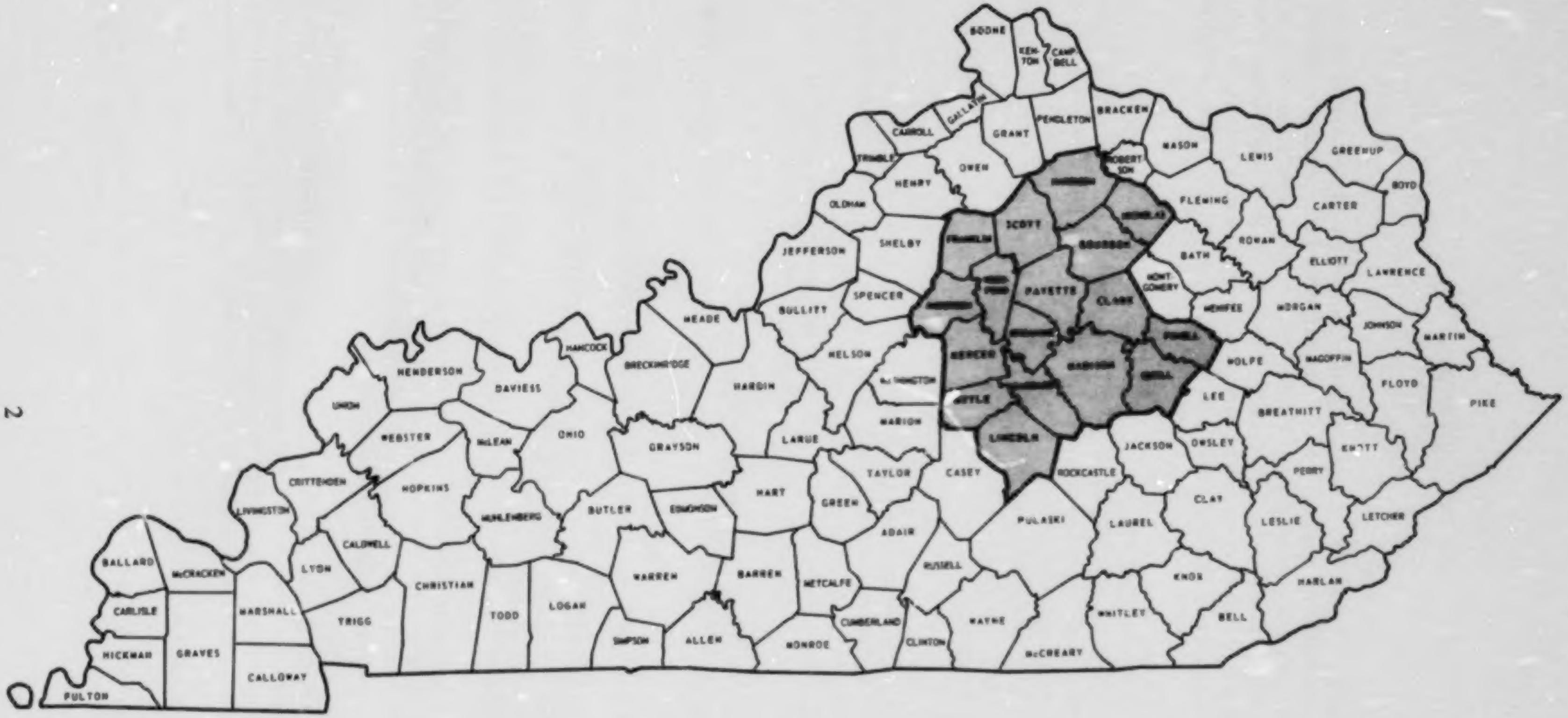
BOONE
KEN-TON
CAMP BELL
GALLATIN
GRANT
PENDLETON
BRACKEN
CARROLL
TRIMBLE
OWEN
ROBERT SON
MASON
LEWIS
GREENUP
BOYD
HENRY
HARRISON
OLDHAM
FLEMING
CARTER
SCOTT
NICHOLAS
FRANKLIN
BOURBON
ROWAN
ELLIOTT
JEFFERSON
SHELBY
BATH
LAWRENCE
WOOD-FORD
FAYETTE
MONT-GOMERY
SPENCER
CLARK
MENIFEE
MORGAN
JOHNSON
BULLITT
MEADE
MARTIN
HANCOCK
POWELL
MAGOFFIN
NELSON
WOLFE
HENDERSON
BRECKINRIDGE
MERCER
DAVIESS
HARDIN
WASHINGTON
MADISON
ESTILL
FLOYD
LEE
PIKE
UNION
BOYLE
BREATHITT
OHIO
MARION
WEBSTER
McLEAN
LARUE
LINCOLN
JACKSON
OWSLEY
KNOTT
GRAYSON
CRITTENDEN
HOPKINS
TAYLOR
CASEY
ROCKCASTLE
PERRY
HART
GREEN
CLAY
LIVINGSTON
MUHLENBERG
BUTLER
EDMONSON
LESLIE
LETCHER
ADAIR
PULASKI
LAUREL
CALDWELL
BALLARD
LYON
McCRACKEN
CHRISTIAN
WARREN
BARREN
METCALFE
RUSSELL
KNOX
HARLAN
MARSHALL
LOGAN
TODD
TRIGG
CARLISLE
CUMBERLAND
WAYNE
WHITLEY
BELL
SIMPSON
ALLEN
MONROE
CLINTON
McCREARY
HICKMAN
GRAVES
CALLOWAY
FULTON

Figure 1. Bluegrass Region

STAFF AND ACKNOWLEDGEMENTS

This demonstration was the responsibility of Spindletop's Area Development Division. Project management was provided by Alan L. McElhaney and the project team consisted of Gerald R. Gehrt, Jeffrey J. Kell, Glen A. Ross, David G. Schmeling, Max J. Wasserman, Andrew J. Winfrey, and Robert K. Wood with report editing provided by Ree H. McQueen.

The project team wishes to express its appreciation to the many persons who contributed their time and effort to the project. Among those to whom the team is especially indebted are the Board of Directors of the Bluegrass Solid Waste Disposal Corporation, the mayors and county judges within the Bluegrass district, and the personnel of the Division of Solid Waste of the Kentucky State Health Department.

The funding of the demonstration was provided by a grant from the Office of Solid Waste Management Programs of the Environmental Protection Agency with matching funds provided by the Kentucky Program Development Office, local jurisdictions, and Spindletop Research, Inc.

II. METHOD OF APPROACH

The Bluegrass solid waste demonstration project encompassed three segments: the design of a solid waste disposal system; the design of a solid waste management system; and the identification of sources of financing.

In designing a solid waste disposal system for the Bluegrass Area Development District, Spindletop used a systems approach which encompassed a comprehensive overview of various parameters governing solid waste disposal. Evaluations were made of solid waste collection and disposal practices. Types and quantities of solid waste were determined. In determining the number and location of sanitary landfills needed to serve the Bluegrass area, quantities of solid waste, haul distances, and the cost of individual operations versus the cost of a regional system all were considered. However, because adequate design and operating cost information was not available for small communities, an economic evaluation of sanitary landfills for small communities was performed before conducting the actual analysis.

The management system design was based on the inputs of public officials and private citizens so that it would satisfy the needs of local areas. Meetings were conducted with public officials and interested individuals and groups. From input from these discussions, the articles of incorporation and bylaws were developed for the nonprofit corporation.

Contact was made with all mayors and county judges in the Bluegrass District to solicit their inputs in designing the nonprofit corporation. The organization of the management system was designed through extensive interaction between the project staff, public officials, and other interested individuals.

In evaluating various sources of financing, Spindletop considered local governmental entities as a primary source whose fees would allow the system to operate on a pay-as-you-go basis if sufficient volume were experienced to allow a realistic rate structure.

The sources of leasing of land and equipment were identified, as well as potential sources of borrowed funds. The feasibility of bonded indebtedness was also investigated. Since less borrowed funds are needed as the amount of grants or subsidies is increased, the various assistance programs of Farmers Home Administration, Environmental Protection Agency, Small Business Administration, and Economic Development Administration were investigated.

The nature and interdependency of the three tasks were important to the execution of the demonstration. Officials would not commit themselves until they knew the costs; yet the costs could not be determined until the volumes of solid waste were known; and the financing could not be done until the participants were known.

In spite of these drawbacks, it was decided to design the management system and the disposal system to include the entire Bluegrass Area Development District, regardless of cooperation from the jurisdictions. In this way, the total system could be scaled down to meet less extensive requirements if all jurisdictions did not participate in the initial phase of implementation, or if all activities of the Corporation were not implemented.

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III. THE BLUEGRASS AREA DEVELOPMENT DISTRICT

THE LAND

The Bluegrass Area Development District (BGADD) of Kentucky is one of 15 Area Development Districts created by a state executive order in 1968. The 15 districts, shown in Figure 2, were formed on the basis of market centers and political, social and cultural affinities.

The Bluegrass District, shown in Figure 3, encompasses 17 counties–Anderson, Bourbon, Boyle, Clark, Estill, Fayette, Franklin, Garrard, Harrison, Jessamine, Lincoln, Madison, Mercer, Nicholas, Powell, Scott and Woodford. The District consists of 4,316 square miles, an area larger than Delaware and more than twice the size of Rhode Island. From east-west, it extends about 80 miles; from north-south, about 95 miles.

The major portion of the District is situated within the Bluegrass Region, one of six physiographic regions of Kentucky. As shown in Figure 4, several counties to the south–Powell, Estill, Madison, Garrard, Lincoln and Boyle–are partly situated in the Knobs Region. The Pennyroyal Region covers a portion of Lincoln County at the southernmost tip of the District. The Eastern Mountains and Coalfield Region extends into Estill and Powell Counties to the southeast. Characteristics of predominant soils in the BGADD are presented in Table 1.

The Inner Bluegrass area–one of three subdivisions of the Bluegrass Region, lies within the boundaries of the BGADD. It includes 2,000 square miles, or about 1.3 million acres of karsted, rolling to gently sloping land. The only interruption is the deep gorge cut by the Kentucky River. The area's surface is underlain with formations of limestone. Water acting on the limestone has formed sinks, surface ponds, underground drainage channels, and cavities. The underground drainage channels can transport water and pollutants directly to surface streams. Practically all of this area is in cropland and grassland. Only two percent is woodland.

Surrounding the Inner Area is the Hills of the Bluegrass which feature little level land and in some places–especially to the north–deep stream cuts. The area is rugged, because of steep slopes where bedrock is exposed and cultivation is usually prevented. Most of the area is grassland and cropland. Less than three percent is woodland. The area's surface is predominately underlain with shale and limestone.

The Outer Bluegrass Area, the third subdivision, is similar to the inner area except it has slightly more woodland. Beyond the Bluegrass Region are the Knobs--scattered, conical hills. Normally steep sloped, these hills are separated by plains and streams. Land use consists of woodland, pasture land, cropland.

The extreme southeastern tip of the BGADD lies in the Escarpment subdivision of the Eastern Mountains and Coalfield Region. The area is capped by resistant rock which protects the less resistant underlayment. This area is noted for its steep, rugged appearance, natural bridges, and picturesque forests.

The last of the four natural regions within the BGADD is the Pennyroyal Region. The Eastern subdivision of the Pennyroyal touches the southern tip of the District. Sinks and underground channels formed in limestone are common.

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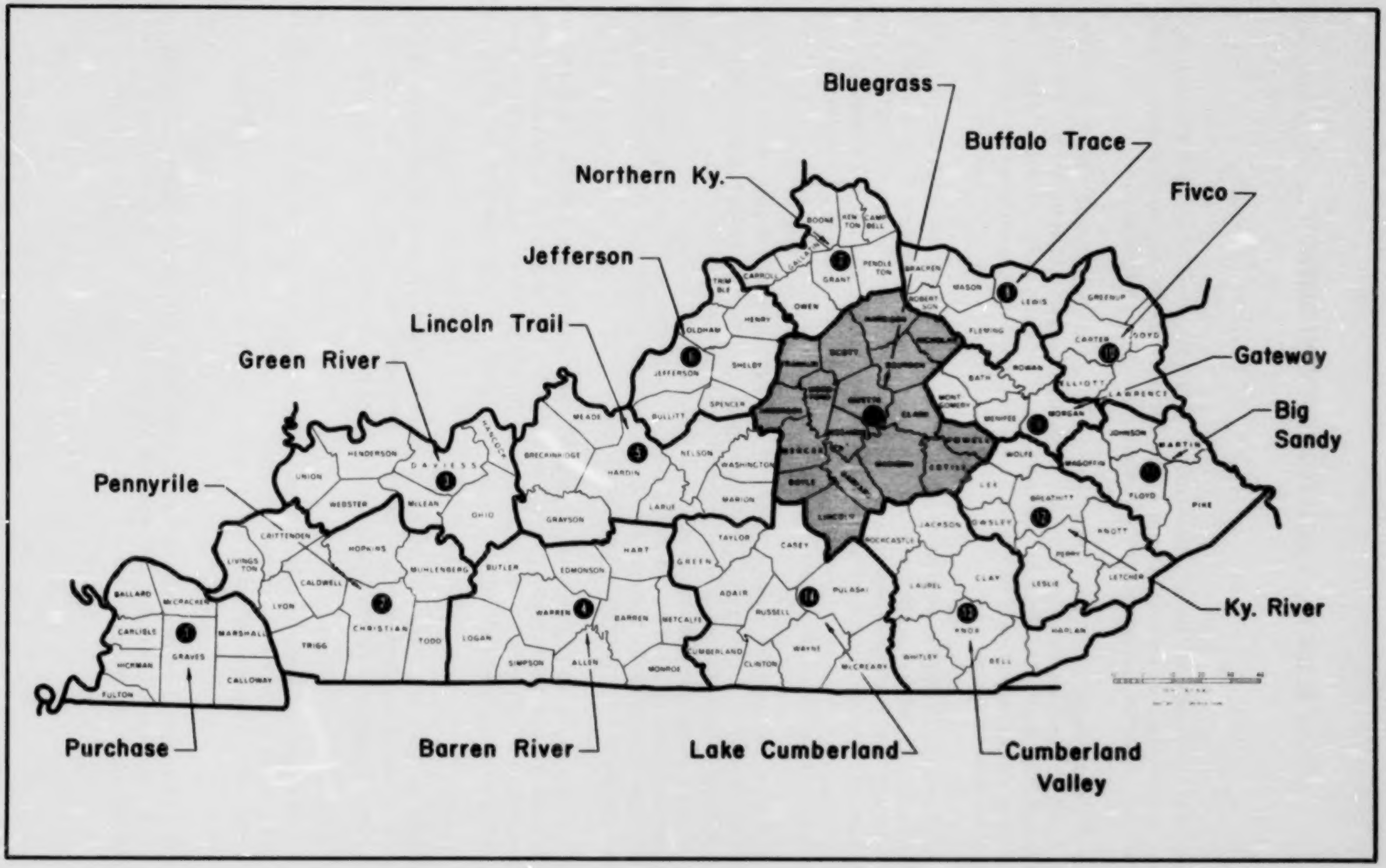
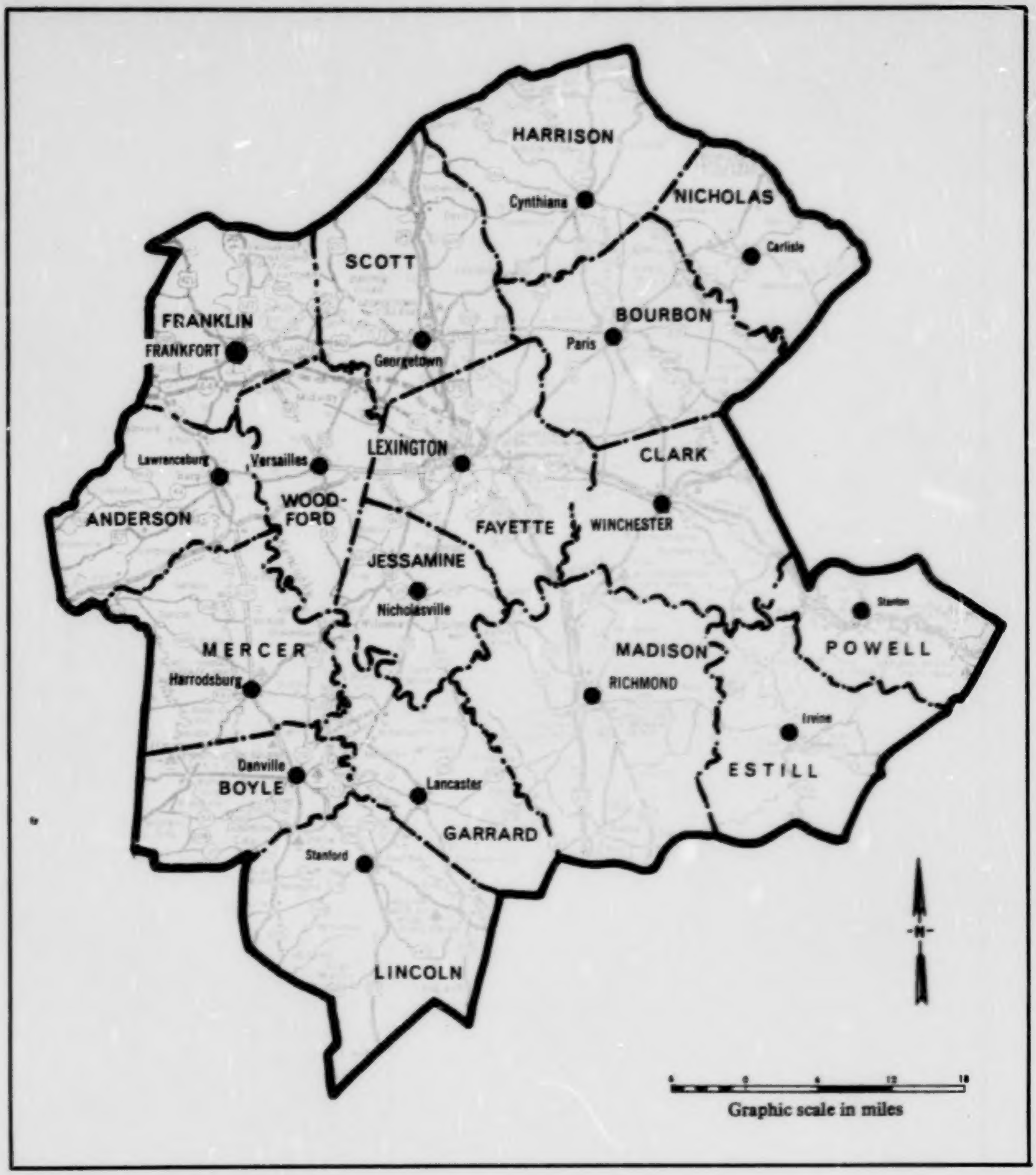

Bluegrass
Buffalo Trace
Northern Ky.
Fivco
Jefferson
Gateway
Lincoln Trail
Big
Sandy
Green River
Pennyrile
Ky. River
Purchase
Barren River
Lake Cumberland
Cumberland
Valley
BOONE
KENTON
CAMPBELL
GALLATIN
GRANT
PENDLETON
CARROLL
TRIMBLE
OWEN
BRACKEN
ROBERTSON
MASON
LEWIS
GREENUP
CARTER
BOYD
ELLIOTT
LAWRENCE
FLEMING
ROWAN
BATH
MONTGOMERY
MENIFEE
MORGAN
JOHNSON
MARTIN
MAGOFFIN
FLOYD
PIKE
WOLFE
LEE
OWSLEY
BREATHITT
KNOTT
PERRY
LETCHER
LESLIE
HARLAN
JACKSON
CLAY
ROCKCASTLE
LAUREL
KNOX
WHITLEY
BELL
OLDHAM
HENRY
SHELBY
JEFFERSON
SPENCER
BULLITT
NELSON
WASHINGTON
MARION
MEADE
BRECKINRIDGE
HARDIN
LARUE
GRAYSON
HANCOCK
DAVIESS
HENDERSON
UNION
WEBSTER
McLEAN
OHIO
CRITTENDEN
LIVINGSTON
HOPKINS
MUHLENBERG
CALDWELL
LYON
CHRISTIAN
TRIGG
TODD
BALLARD
McCRACKEN
CARLISLE
GRAVES
MARSHALL
HICKMAN
CALLOWAY
FULTON
BUTLER
EDMONSON
HART
WARREN
BARREN
METCALFE
LOGAN
SIMPSON
ALLEN
MONROE
TAYLOR
CASEY
GREEN
ADAIR
RUSSELL
PULASKI
CUMBERLAND
CLINTON
WAYNE
McCREARY
LINCOLN
BOYLE
MERCER
ESTILL

Figure 2. Official Boundaries of the Kentucky Area Development Districts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Versailles
WOOD-
FORD
ANDERSON
FAYETTE
WINCHESTER
JESSAMINE
Nicholasville
Stanton
POWELL
MERCER
MADISON
Harrodsburg
RICHMOND
Irvine
Danville
BOYLE
ESTILL
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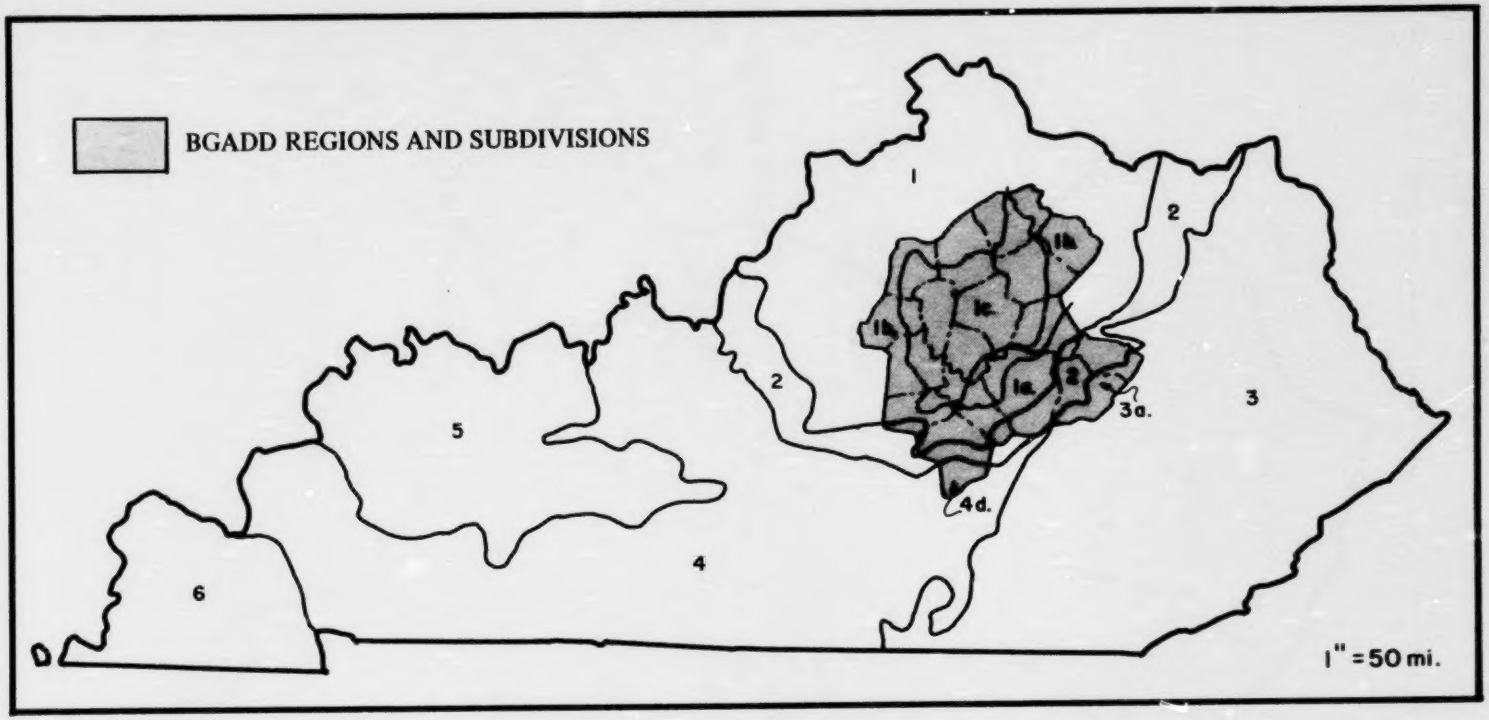
Graphic scale in miles

Figure 3. Bluegrass Area Development District


BGADD REGIONS AND SUBDIVISIONS
1
1a.
1b.
1b.
1c.
2
2
2
3
3a.
4
4d.
5
6
1" = 50 mi.

1. The Bluegrass Region
    a. Outer Bluegrass
    b. Hills of the Bluegrass
    c. Inner Bluegrass
2. The Knobs
3. Eastern Mountain and Coal Field Region
    a. Escarpment Area
4. The Pennyroyal Region
    d. Eastern Area
5. Western Coal Field Region
6. Jackson Purchase Region

Source: Geography of Kentucky, Joseph R. Schwendeman, 1963.

Figure 4. Physiographic Regions of Kentucky

Table 1
Characteristics of Predominant Soils–Bluegrass Area Development District

Physiographic Regions and Subdivisions	Soil Series	Depth to Bedrock (Feet)	Permeability* (inches per hour) (top two feet)	Drainage†	Suitability as a Source of Road Fill
Bluegrass Region Inner Bluegrass					
	Maury	3.0 to 12.0	0.63 to 6.3	Well Drained	Fair
	Mercer	5.0 to 10.0	0.63 to 2.0	Moderately Well	Fair
	Loradale	4.0 to 10.0	0.63 to 2.0	Well	Fair-Poor
Hills of the Bluegrass					
	Eden	1.5 to 2.0	0.05 to 2.0	Somewhat Excessive	Poor
	Fairmont	Less than 3	0.20 to 2.0	Somewhat Excessive	Fair-Poor
Outer Bluegrass					
	Lowell	1.5 to 6+	0.05 to 5.0	Well	Fair-Poor
	Nicholson	4.0 to 6.0	0.00 to 5.0	Well to Mod. Well	Fair
	Shelbyville	4.5 to 9.0	0.05 to 5.0	Well	Fair-Poor
Knobs Region					
	Coyler	.3 to .5	0.80 to 2.0	Excessive	Poor
	Rockcastle	1.0 to 3.0	0.02 to 2.5	Somewhat Excessive	Poor
	Westmoreland	1.0 to 2.5	0.63 to 2.0	Somewhat Excessive	Good to Poor
Eastern Mountain and Coalfield Region Escarpment	Muskingum	1.0 to 3.0	5.0 to 10.0	Somewhat Excessive	Good
	Westmoreland	1.0 to 2.5	0.63 to 2.0	Somewhat Excessive	Good to Poor
Pennyroyal Region Eastern	Baxter	3.0 to 10	0.20 to 2.0	Well	Fair to Poor
	Dickson	4.0 to 6+	0.20 to 2.0	Moderately Well	Fair
	Westmoreland	1.0 to 2.5	0.63 to 2.0	Somewhat Excessive	Good to Poor

*Premeability: refers to the rate at which water will pass vertically through a soil in its natural state

†Drainage: refers to the rapidity and extent of the horizontal removal of surface and subsurface water from the soil.

Source: U.S.D.A. Soil Survey.

THE DEMOGRAPHY AND ECONOMICS

Pre-1960

Before 1960, the BGADD was predominately agricultural. Tobacco and the horse industries were the prime employers. In 1950, the population of the BGADD was 349,932. By 1960, the population had increased to 385,218.

Family income was below the national average. In 1959, for example, nearly 35 percent of all families earned less than $3000 annually as compared with 17.2 percent nationally.*

In 1960, District unemployment was 4.9 percent, or 0.6 percent below the national average. The exceptions were Estill and Powell Counties. These two Appalachian counties experienced unemployment more than twice the U.S. average. Of those employed in Estill and Powell, one in four worked outside the county.

As recently as 1960, more than 50 percent of adults over 25 had less than nine years of schooling as compared with a national average of 39.7 percent.

Table 2
County Employment: Total Agriculture, Manufacturing--BGADD, 1968

County	Total	Agriculture	Manufacturing
Anderson	2,883	756	516
Bourbon	6,664	1,743	1,069
Boyle	10,479	1,067	2,993
Clark	9,806	1,401	2,649
Estill	2,894	552	206
Fayette	89,423	2,622	16,234
Franklin	21,500	763	3,120
Garrard	3,741	1,462	716
Harrison	5,745	1,544	1,303
Jessamine	3,667	1,104	279
Lincoln	4,252	1,738	637
Madison	12,293	1,966	2,091
Mercer	5,540	1,340	1,410
Nicholas	2,996	1,039	790
Powell	1,546	334	270
Scott	5,977	1,419	1,344
Woodford	5,548	1,187	2,337
BGADD	194,954	22,037	37,964
State	1,110,785	121,082	243,363

Source: Kentucky County Data, Kentucky Department of Commerce, 1970.

Post 1960

In the sixties, the District experienced considerable modernization. Industry and commerce flourished in the metropolitan centers and dotted the interstate highways. The District's manpower was put to work. Table 2 shows a breakdown of total employment in agriculture and manufacturing activities.

The surge of new industry in the early 1960's added substantially to the industrial mix. In fact, on a percentage-of-employment basis, some of the smaller counties are more industrialized than the state as a whole. Figure 5 points up these counties, and Table 3 lists manufacturing firms with 400 employees or more.

Per capita income increased in the District during the last 10-year period. For example, in 1968, estimated per capita income in Fayette County was $3,492, or $1,714 above the 1959 figure.†

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* *Statistical Abstract of the United States.* 1969, No. 40, p. 35.
†*Kentucky Vital Statistics,* 1969.

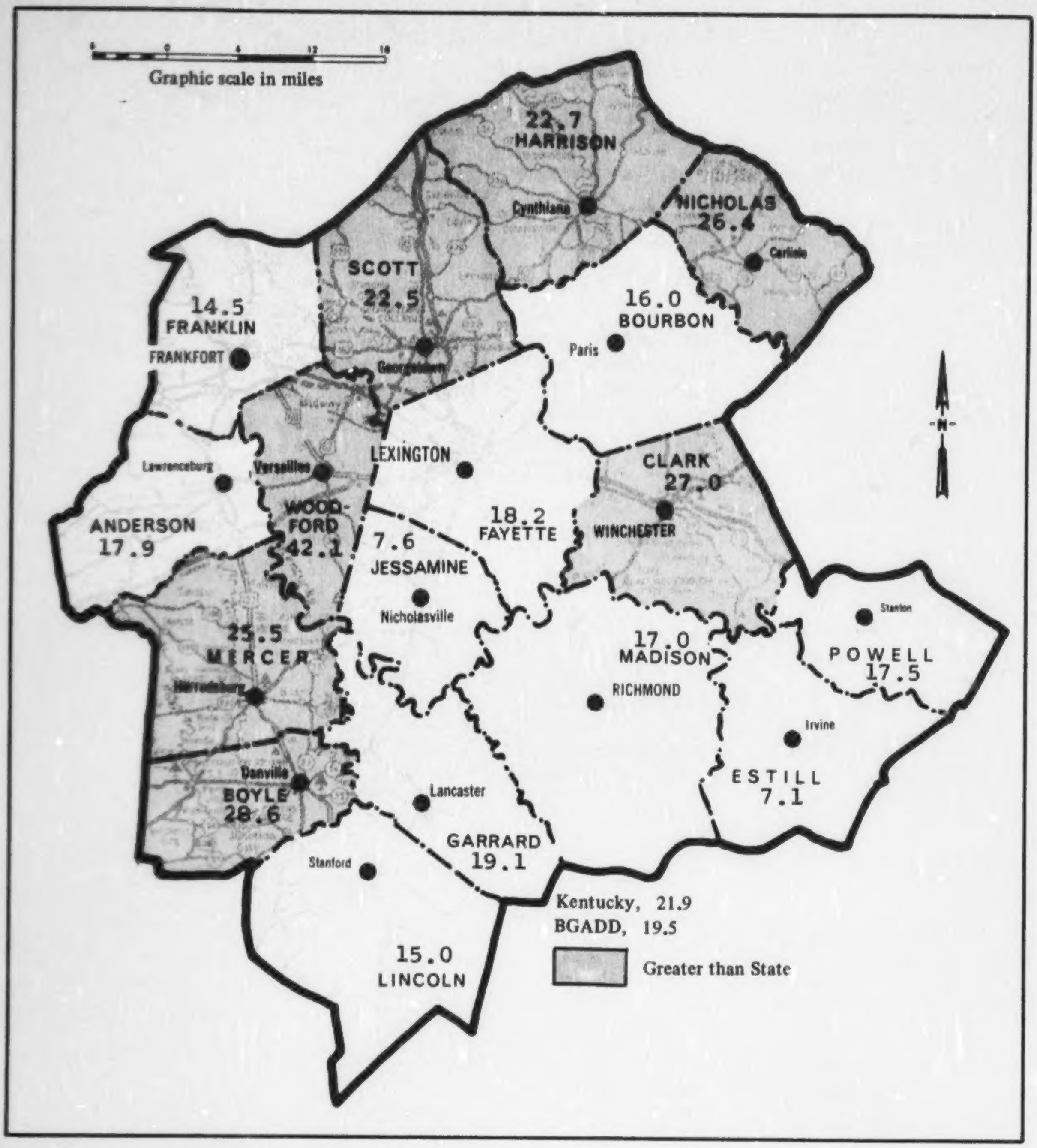

Graphic scale in miles
22.7
HARRISON
Cynthiana
NICHOLAS
26.4
Carlisle
SCOTT
22.5
Georgetown
14.5
FRANKLIN
FRANKFORT
16.0
BOURBON
Paris
LEXINGTON
CLARK
27.0
WINCHESTER
Lawrenceburg
Versailles
WOOD-
FORD
42.1
ANDERSON
17.9
18.2
FAYETTE
7.6
JESSAMINE
Nicholasville
Stanton
25.5
MERCER
Harrodsburg
17.0
MADISON
POWELL
17.5
RICHMOND
Irvine
Danville
BOYLE
28.6
Lancaster
ESTILL
7.1
GARRARD
19.1
Stanford
Kentucky, 21.9
BGADD, 19.5
15.0
LINCOLN
▨ Greater than State
N

Figure 5. Manufacturing Employment as a Percentage of Total Employment–BGADD, 1968

Table 3
Major Manufacturing Firms–BGADD, 1970

County/City	Name	Product	Employment
Anderson Lawrenceburg	Florida Tile Industries	wall tile	500
Bourbon Paris	Blue Grass Industries	garments	400
	Hansley, Inc.	garments	416
Boyle Danville	American Greetings Corp.	cards, etc.	700
	Corning Glass Works	bulbs, tubing	500
	Genesco, Inc.	shoes	500
	Palm Beach Company	suits	603
	Whirlpool Corporation	ranges	500
Clark Winchester	Bundy Tubing Company	steel tube	482
	Rockwell-Standard Co.	truck axels	900
	Sylvania Electric Products, Inc.	lamps	673
Fayette Lexington	IBM Corp.	typewriters, dictating	5,800
	Irvin Industries, Inc.	parachutes, auto belts	800
	Lexington Redryers, Inc.	tobacco redrying	500
	Parker Seal Company	synthetic rubber seals, rings	650
	R.J. Reynolds Tobacco Company	tobacco processing	400
	The Square D Company	elec. equip.	1,642
	Trane Company	A.C., air handling, heating equipment	750
Franklin Frankfort	National Distillers Products Company	whiskey, feed	810
	H.K. Porter Co.	auto and appliance trim	439
	Union Underwear Co., Inc.	men's underwear	767

Table 3 (Cont'd)

County/City	Name	Product	Employment
Harrison			
Cynthiana	Kawneer Co.	appliances and auto trim	442
	Ladish Co.–Ky. Div.	valves, fittings	415
Lincoln			
Stanford	Cowden Stanford Co.	clothes	400
Madison			
Berea	Gibson Greeting Card Co.	cards, etc.	400
	Parker Seal Co.	rub-o-rings	592
Richmond	Westinghouse Electric Corp.	miniature electric bulb	801
Mercer			
Harrodsburg	Cricketeer	suits	488
Nicholas			
Carlisle	Blue Grass Industries, Inc.	garments	635
Scott			
Georgetown	Universal Wire Springs Division, Hoover Ball and Bearing Co.	springs and frames	483
Woodford			
Versailles	Rand McNally and Co.	printing and binding	680
	Texas Instruments	thermostats and controls	525

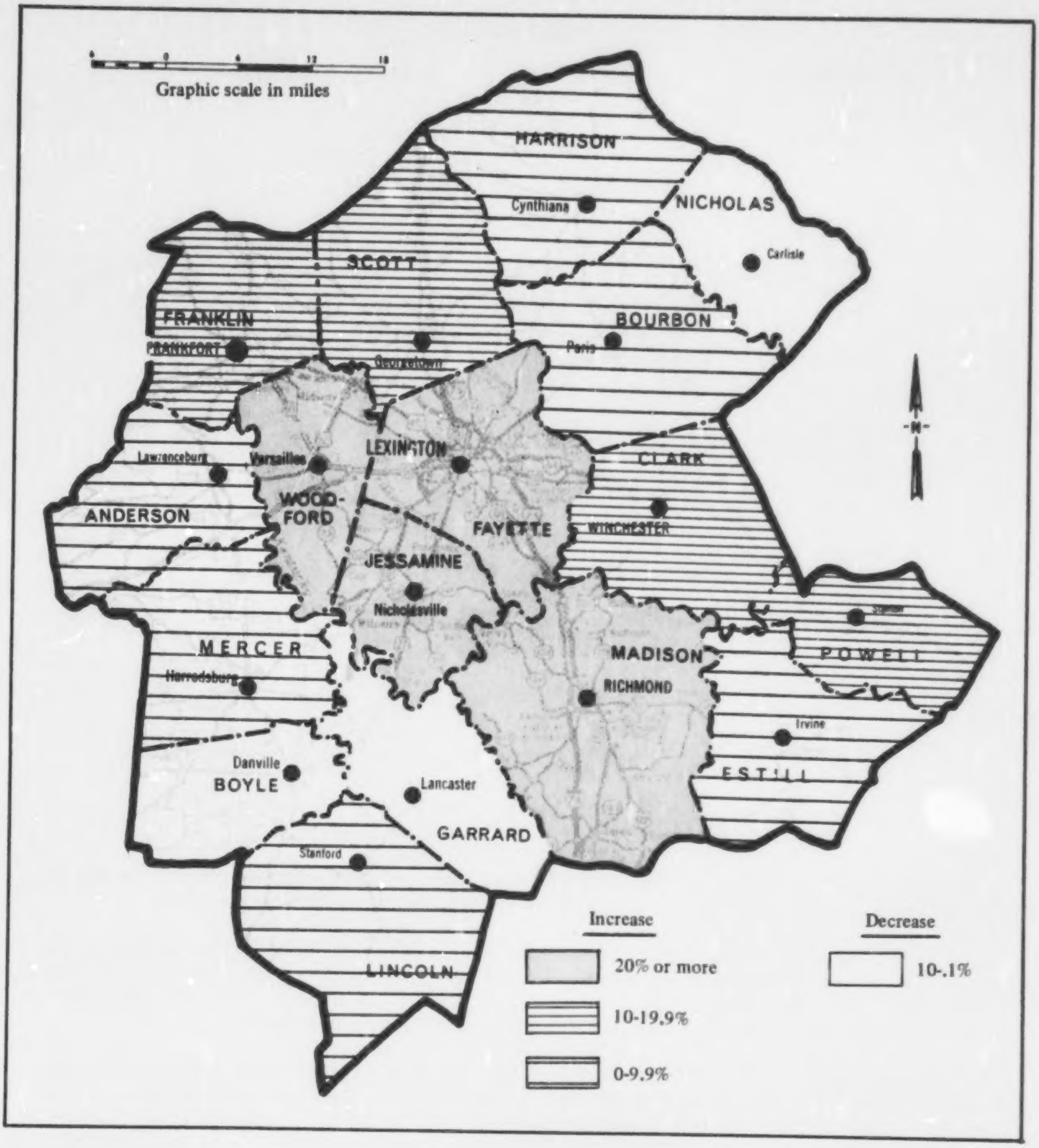
Source: *Kentucky Directory of Manufacturers*, 1970.

During the decade from 1960 to 1970, unemployment rates for the District averaged 3.3 percent, or 0.3 percent less than the U.S. rate. Again, Estill and Powell Counties were the exceptions.

In 1970, the population of the Bluegrass was 457,562, about the number of people in each of the cities of Cincinnati, Atlanta and Minneapolis. Table 4 shows the population breakdown for counties and cities within the District, plus the percentage change from 1960 to 1970. The percent of increase and decrease in population for the 17 counties is also shown in Figure 6.

As shown in Figure 6, three counties–Boyle, Garrard and Nicholas–experienced population decline between 1960 and 1970 according to the 1970 Census.* At that, these counties show less than five percent decline each, as contrasted with declines of 10 and 30 percent in some adjacent counties. Overall, population grew at an average rate of 18.8 percent during the period. At the same time, nine cities expanded their populations by over 30 percent. Only five cities–Millersburg, Junction City, Irvine, Ravenna, and Carlisle–failed to increase their net population during the decade.

*1970 *Census of Population*, Advance Report, PC(V1)-19 Kentucky, U.S. Department of Commerce/Bureau of the Census, December, 1970.



Graphic scale in miles
HARRISON
Cynthiana
NICHOLAS
Carlisle
SCOTT
FRANKLIN
FRANKFORT
Georgetown
BOURBON
Paris
LEXINGTON
Versailles
Lawrenceburg
CLARK
WOOD-FORD
ANDERSON
FAYETTE
WINCHESTER
JESSAMINE
Nicholasville
MERCER
Harrodsburg
MADISON
RICHMOND
POWELL
Irvine
ESTILL
Danville
BOYLE
Lancaster
GARRARD
Stanford
LINCOLN
Increase
20% or more
10-19.9%
0-9.9%
Decrease
10-.1%

Figure 6. Population Change–BGADD, 1960-70

Table 4
Population Breakdown–BGADD, 1960-1970

County*/City	1970	1960	Percent Change (+ or-)
Anderson	9,358	8,618	+8.6
Lawrenceburg	3,579	2,523	+41.9
Bourbon	18,476	18,178	+1.6
Millersburg	788	913	-13.7
North Middletown	433	291	+48.8
Paris	7,823	7,791	+0.4
Boyle	21,090	21,257	-0.8
Danville	11,542	9,010	+28.1
Junction City	1,046	1,047	-0.1
Perryville	730	715	+2.1
Clark	24,090	21,075	+14.3
Winchester	13,402	10,187	+31.6
Estill	12,752	12,466	+2.3
Irvine	2,918	2,955	-1.3
Ravenna	784	921	-14.9
Fayette	174,323	131,906	+32.2
Lexington	108,137	62,810	+72.2
Franklin	34,481	29,421	+17.2
Frankfort	21,356	18,365	+16.3
Garrard	9,457	9,747	-3.0
Lancaster	3,230	3,021	+6.9
Harrison	14,158	13,704	+3.3
Cynthiana	6,356	5,641	+12.7
Jessamine	17,430	13,625	+27.9
Nicholasville	5,829	4,275	+36.4
Wilmore	3,466	2,773	+25.0
Lincoln	16,663	16,503	+1.0
Crab Orchard	861	808	+6.6
Hustonville	413	387	+6.7
Stanford	2,474	2,019	+22.5
Madison	42,730	33,482	+27.6
Berea	6,956	4,302	+61.7
Richmond	16,861	12,168	+38.6
Mercer	15,960	14,596	+9.3
Burgin	1,002	879	+14.0
Harrodsburg	6,741	6,061	+11.2
Nicholas	6,508	6,677	-2.5
Carlisle	1,579	1,601	-1.4
Powell	7,704	6,674	+15.4
Clay City	983	764	+28.7
Stanton	2,037	753	+170.5
Scott	17,948	15,376	+16.7
Georgetown	8,629	6,986	+23.5

*County population figure includes the cities in the county.

Although the seventeen-county BGADD is shifting from an agricultural economy to one of light industry, it still has a great deal of agriculture today. In 1968, the District's total work force numbered 194,954 persons, of which 11 percent or 22,037, were engaged in agriculture. Eleven of the 17 counties reported more than 20 percent of the work force engaged in agriculture. A percentage breakdown of the agricultural work force, by county, is shown in Figure 7.

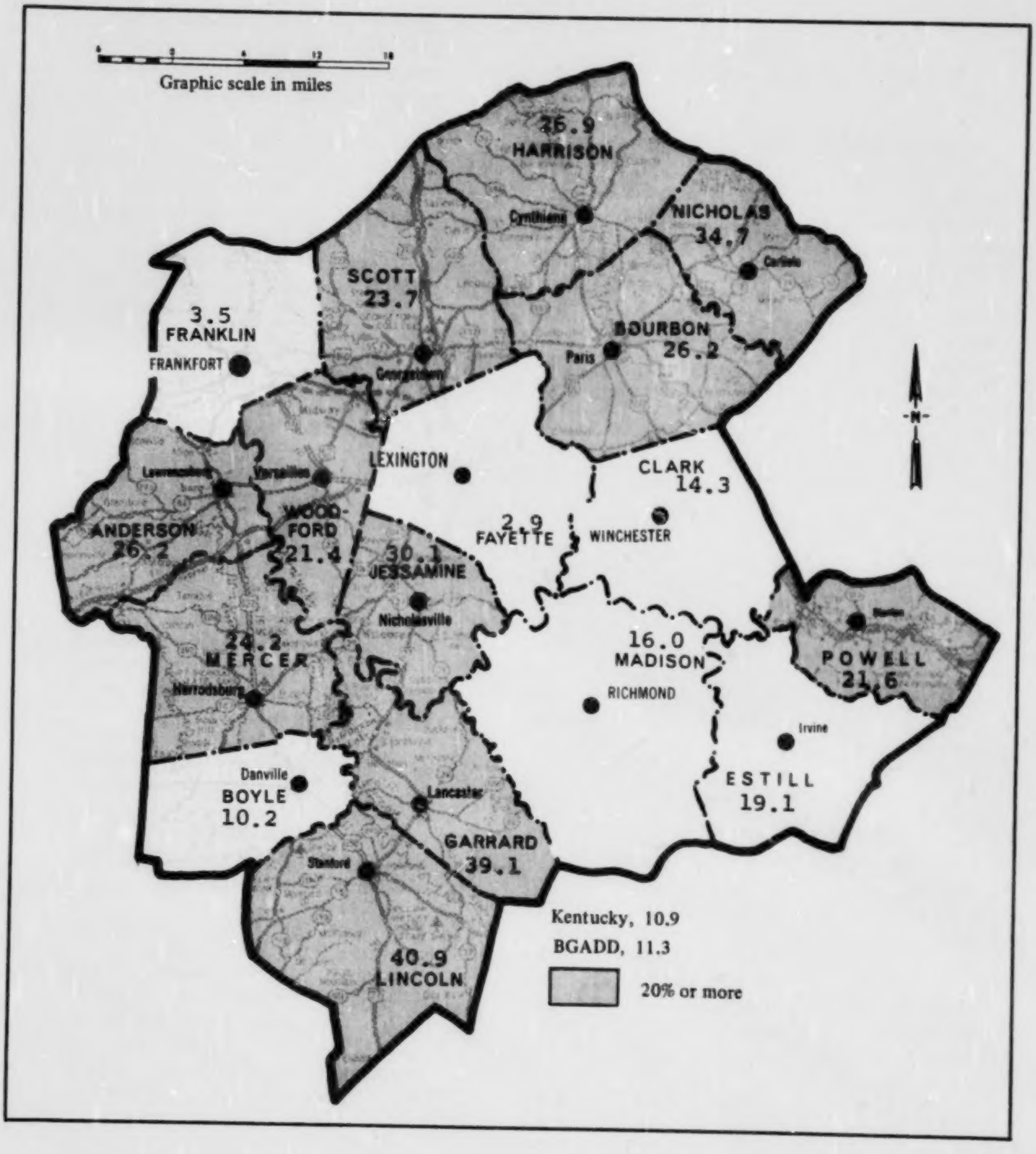
THE SOLID WASTE PROBLEM

The Attitudes Toward Solid Waste

In spite of statistics which indicate a buildup of urban centers and a steady increase in urban population, the Bluegrass District continues to possess a rural culture. Scores of urban residents continue to hold to a rural life style and culture. In fact, it is not uncommon for urban families–having lived in the city for years–to return to their counties of origin. They prefer long commuting hours to the relatively impersonal life of the urban center. Although diluted by urban impact, the "mountain culture" of the Bluegrass and Eastern Kentucky represents the major factor in understanding the character and solid waste problems of the region.

The local Department of Health monitors solid waste disposal at the local level. To date, however, they have not pursued an aggressive program of solid waste regulation. Several factors figure into the problem. Small local health budgets and overwhelming work loads are just two.

Some progress, however, is being made. For example, the solid waste staff of the State Health Department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Cynthiana
NICHOLAS
34.7
Carlisle
SCOTT
23.7
Georgetown
3.5
FRANKLIN
FRANKFORT
BOURBON
Paris
26.2
Versailles
Lawrenceburg
LEXINGTON
CLARK
14.3
WOOD-
FORD
21.4
ANDERSON
26.2
30.1
JESSAMINE
2.9
FAYETTE
WINCHESTER
Nicholasville
Stanton
24.2
MERCER
Harrodsburg
16.0
MADISON
RICHMOND
POWELL
21.6
Irvine
Danville
BOYLE
10.2
Lancaster
ESTILL
19.1
GARRARD
39.1
Stanford
40.9
LINCOLN
Kentucky, 10.9
BGADD, 11.3
20% or more

Figure 7. Agricultural Employment as a Percentage of Total Employment–BGADD, 1968

Table 4 (Cont'd)

County*/City	1970	1960	Percent Change (+ or -)
Woodford	14,434	11,913	+21.2
Midway	1,278	1,044	+22.4
Versailles	5,679	4,060	+39.9
Total Population	457,562	385,218	+18.8

*County population figure includes the cities in the county.

Source: *1970 Census of Population*, Advance Report, PC (V1)-19, Kentucky, U.S. Department of Commerce/Bureau of the Census, December, 1970.

is attempting to change disposal methods by applying pressure at a level which will not destroy their working relationship with jurisdictions. In some cases, usually where a critical health menace exists, they have applied maximum pressure, e.g., closing a burning dump. In other cases they have discreetly suggested disposal reform.

Another built-in problem may be the attitude of the county judge who is presiding officer of the county Fiscal Court and a member of the local board of health. If a judge does not view environmental protection or solid waste disposal as a high priority, he may direct staff efforts to other priorities.

Beyond this, a judge may levy fines for littering and roadside dumping, but enforcement and prevention in these areas are spotty. Some local officials believe that enforcement officers do not have the time to enforce environmental laws and regulations. Others believe that many violators are not at fault since adequate sites and disposal methods do not exist in their locality. Still another factor is an official's uncertainty about how the public will react when he cracks down on violators since he must rely on his constituents for reelection.

One final point. The attitudes of metropolitan public officials toward solid waste disposal are better articulated and more positive than those of officials in the rural areas. This is largely because of the visibility of the problem which is magnified in the urban environment, not necessarily because of better understanding of the problem. In fact, in some cases the problem draws the focus of public officials strictly because of citizen protest or because it is politically enhancing to the advocate.

IV. SOLID WASTE DISPOSAL SYSTEM

A systems approach was used in designing the solid waste disposal system for the Bluegrass Area Development District. The analysis involved a comprehensive overview of parameters governing solid waste disposal. Current collection and disposal practices were evaluated. Types and quantities of solid waste were determined. Haul distances and times, haul costs, sanitary landfill costs, transfer station costs–all of which are interrelated–were computed to determine the number and type of disposal operations needed to handle the solid waste generated within the District.

COLLECTION AND DISPOSAL PRACTICES

Kentucky statutes specify that solid waste must be disposed at sites approved and permitted by the Department of Health.* In practice, however, the majority of disposal sites in the Bluegrass district are open dumps. Open burning and roadside dumping are common. In fact, in 1969, the Kentucky Highway Department reported 57 illegal roadside dumps on state highway right-of-ways throughout the 17-county district. Furthermore, a summary of disposal methods indicates that only 25 percent of the solid waste is disposed by operations which have been permitted by the state of Kentucky. Table 5 shows the breakdown of disposal methods in the BGADD.

Table 5
Summary of Disposal Methods in the Bluegrass District

Disposal Method	Tons/Year	Percent of Total
State Permitted Disposal	123,172	25
Open Dumping	157,660	32
Open Burning	14,781	3
Incineration (Municipal Only)	70,258	14
On-site Industrial Disposal	92,328	19
On-site Residential Disposal and Roadside Dumping	34,488	7
Totals	492,687	100

Source: Spindletop Research computations based on field observations and surveys.

Practices in Rural Areas

Residents of nonurban areas represented 38.5 percent (56.1 percent if Fayette County is excluded) of the District population in 1970.† Estimated daily per capita residential solid waste production in the BGADD is slightly less than 2.4 pounds; the total jumps to about four pounds if nonurban industrial, commercial and bulk wastes are added. If there is any salient feature of the solid waste problem in the rural Bluegrass area, it is the lack of collection.

Sixteen of the 17 counties have no county-wide rural collection system. Although most counties are willing to explore ways of implementing a collection system, only one has moved toward implementation. In August, 1970, Franklin County began a limited public rural collection system when it installed 12 containers throughout the county. A private collector services the containers on a "call-me-when-full" basis. Also, Madison County is attempting to deal with the problem by requiring rural residents to haul their household waste to an approved landfill.

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*Kentucky Revised Statutes, Chapter 211

†*1970 Census of Population*, Advance Report, PC (C1)-19, Kentucky, U.S. Department of Commerce/Bureau of the Census, December, 1970.

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On the other hand, disposal is not much better off than collection. Of the 17 counties, only five have disposal sites, and of the five, three are joint-city-county operations. Also, only one of the three sites has received a state permit. The remaining two county owned and operated sites are open dumps. Table 6 shows collection and disposal systems for both cities and counties in the District.

Based on rural residences in the district, about 19 percent of the total population in the Bluegrass ADD does not have collection services. In some rural counties, the number is 50 percent. Faced with the problem of disposing of their own solid waste, rural families must choose one of five basis alternatives: (1) nearby ravine or creekbed, (2) backyard burning, (3) illegal roadside dump, (4) the highway litter barrel, or (5) county, city, or private dumps or landfills.

Practices in Cities

As shown in Table 6, 16 of the 29 Bluegrass cities operate their own collection systems. Of the 13 remaining cities, three contract with private collectors on a fixed price contract, and 10 are served by private collectors which operate independently of municipal control. However, eight of these 10 cities allow private collectors to use public disposal sites which, in effect, is a form of control over their operation within the cities. This leaves only two cities without any control over collection.

Collection is mandatory by city ordinance in 17 cities. Within the District, there are about 15 major private collectors, and at least from 15 to 20 small collectors.* Of the 12 cities with a population of over 5,000, 11 have municipal residential waste collection.

In the majority of cases, municipal collectors do not service all solid waste producers. In fact, 26 percent of the total solid waste is handled by the producer. About 20 percent of the total residential waste is disposed on rural properties or roadside dumps. About 50 percent of the total industrial waste is handled by the individual industry.

Disposal of solid waste for 23 of the 29 cities is handled at public disposal sites. Disposal for the remaining six cities includes: two county dumps, three private dumps, and one dump outside the county. Public disposal sites operated by the 23 cities include: four incinerators, six landfills, and 17 open dumps.† Of the three private dumps used, one city pays the disposal site operator on a monthly basis and allows residents and private collectors operating within the city to dispose of their solid waste at no direct cost.

Four of the five most populated cities in the Bluegrass District dispose of combustible solid waste by municipal incineration. As shown in Figure 8, the municipal incinerators are in Lexington, Frankfort, Winchester, and Paris. About 15 to 20 percent of the waste fed into the incinerators remain as ash and other noncombustibles which, in turn, are disposed at open dumps. Another 10 percent goes out the stack as air pollution.

Operating Costs

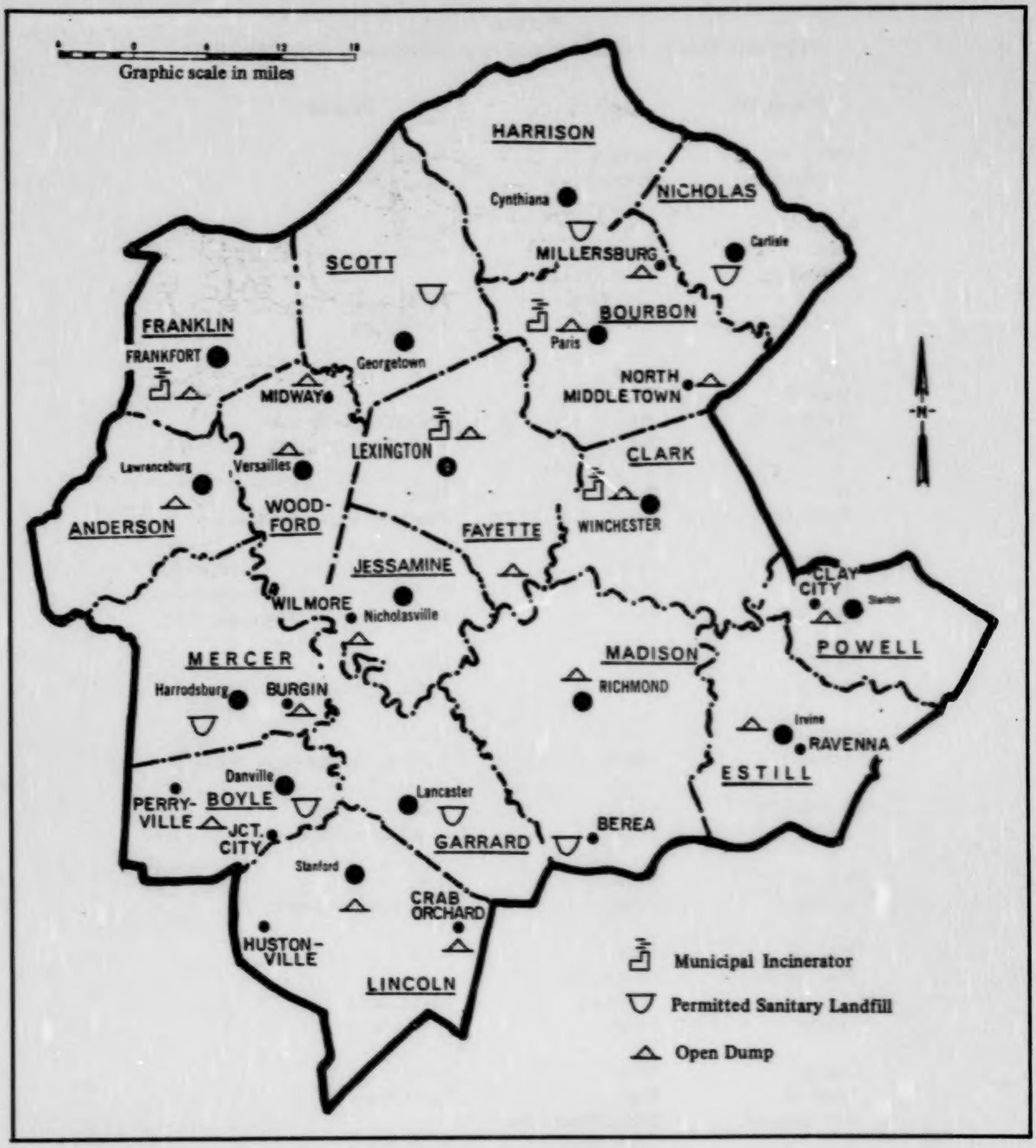
One of the most difficult problems in evaluation of the solid waste problem in the BGADD was determining the costs of collection and disposal operations within the District. Few cities maintain line-item budgets that show administrative, manpower, equipment and other operational costs. For example, the cost and financing of land, equipment, incinerators, utilities and miscellaneous items

*State Solid Waste Program Records.

†Four of 17 open dumps operate in conjunction with incinerators.

Table 6
City and County Collection and Disposal Systems–BGADD, 1970

County/City	Collection*	Disposal
Anderson	None	None
Lawrenceburg	Private	Private dump
Bourbon	None	None
Paris	Public	Public incinerator-Public dump
Millersburg	Public (Private subcontract†)	Public dump
North Middletown	Private	Public dump
Boyle	None	Public dump
Perryville	Public	None (County dump)
Junction City	Private	None (County dump)
Danville	Public	Public sanitary landfill
Clark	None	None
Winchester	Public	Public incinerator-Public dump
Estill	None	Public dump (2 cities + county own)
Irvine	Public	Public dump (2 cities + county own)
Ravenna	Public	Public dump (2 cities + county own)
Fayette	None	Public dump
Lexington	Public	Public incinerator-Public dump
Franklin	Public‡	None
Frankfort	Public	Public incinerator-Public dump
Garrard	None	None
Lancaster	Public	Public sanitary landfill
Harrison	None	None
Cynthiana	Public	Public sanitary landfill
Jessamine	None	None
Nicholasville	Private (free disposal)	Private dump
Wilmore	Private	Private dump
Lincoln	None	None
Stanford	Public	Public dump
Crab Orchard	Public (Subcontract to private)	Public dump
Hustonville	Private	None (Boyle County dump)
Madison	None	None
Richmond	Public	Public dump
Berea	Public	Public sanitary landfill



6
0
6
12
18
Graphic scale in miles
HARRISON
Cynthiana
NICHOLAS
MILLERSBURG
Carlisle
SCOTT
FRANKLIN
FRANKFORT
Georgetown
BOURBON
Paris
NORTH
MIDDLETOWN
MIDWAY
LEXINGTON
CLARK
Lawrenceburg
Versailles
WOOD-
FORD
ANDERSON
FAYETTE
WINCHESTER
JESSAMINE
CLAY
CITY
Stanton
WILMORE
Nicholasville
POWELL
MADISON
MERCER
Harrodsburg
BURGIN
RICHMOND
Irvine
RAVENNA
ESTILL
Danville
PERRY-
VILLE
BOYLE
JCT.
CITY
Lancaster
GARRARD
BEREA
Stanford
CRAB
ORCHARD
HUSTON-
VILLE
LINCOLN
N
Municipal Incinerator
Permitted Sanitary Landfill
Open Dump

Figure 8. Existing Disposal Methods–BGADD, 1970

Table 6 (Cont'd)

County/City	Collection*	Disposal
Mercer	None	None
Harrodsburg	Public (Private subcontract)	Public sanitary landfill
Burgin	Private	Public dump
Nicholas	None	Public sanitary landfill (City/ County)
Carlisle	Private	Public sanitary landfill (City/County)
Powell	None	Public dump (2 City/County)
Stanton	Private	Public dump (2 City/County)
Clay City	Private	Public dump (2 City/County)
Scott	None	None
Georgetown	Public	Public sanitary landfill
Woodford	None	None
Versailles	Public	Public dump
Midway	Public	Public dump

*All counties have some form of limited private collection. Most cities collect residential plus some commercial/industrial.

†Public truck.

‡ Twelve dumpsters (10 yd.); Private subcontract on pickup.

Source: Spindletop Research, Inc.

were not available in most cities. Moreover, estimates given by most cities and counties were usually based on little or no recorded data; however, observation and a review of reported data show that as little as five to 15 percent of collection and disposal budgets is spent on disposal.

THE TYPES AND QUANTITIES OF SOLID WASTE

In 1970, the amount of solid waste generated within the BGADD was estimated at 400,358 tons. Of this amount, residential waste accounted for 197,980 tons; commercial waste, 101,858 tons; industrial waste, 75,541 tons; and bulk waste, 25,051 tons. On a per capita basis, each person generated 4.79 pounds per day–slightly less than the national average, 5.1 pounds per person per day. The amount for the counties within the District ranged from 3.86 to 6.56 pounds per person per day. The national range is from 3.83 to 7.33.* The types and quantities of solid waste generated in the District are presented in Table 7.

Residential wastes are based on the average of 2.37 pounds per capita per day. Commercial waste estimates are based on either 1.00 or 1.40 pounds per person per day. In areas with a large number of commerical establishments, government buildings and major universities, 1.40 pounds were used.

**Technical-Economic Study of Solid Waste Disposal Needs and Practices, PHS Publication No. 1886, 1969.*

Table 7
Type and Quantities of Solid Waste (tons)–BGADD, 1970

County	Population	Residential Waste	Commercial Waste	Industrial Waste†	Bulk Waste	Total	ibs/cap/Day
Anderson	9,358	4,048	1,707	1,681	512	7,948	4.65
Bourbon	18,476	7,991	3,371	795	1,012	13,169	3.91
Boyle	21,090	9,122	3,848	6,944	1,155	21,069	5.47
Clark	24,090	10,420	4,396	4,697	1,319	20,832	4.73
Estill	12,752	5,516	2,327	1,200	698	9,741	4.18
Fayette	174,323	75,399	44,540*	26,579	9,544	156,062	4.90
Franklin	34,481	14,914	8,810*	6,298	1,888	31,910	5.07
Garrard	9,457	4,090	1,725	2,497	518	8,830	5.11
Harrison	14,158	6,124	2,583	2,196	775	11,678	4.51
Jessamine	17,430	7,539	3,180	626	954	12,299	3.86
Lincoln	16,663	7,207	3,040	755	912	11,914	3.91
Madison	42,730	18,482	10,918*	5,618	2,339	37,357	4.79
Mercer	15,960	6,903	2,912	8,420	874	19,109	6.56
Nicholas	6,508	2,815	1,187	401	356	4,759	4.00
Powell	7,704	3,332	1,405	1,918	422	7,077	5.03
Scott	17,948	7,763	3,275	1,410	983	13,431	4.10
Woodford	14,436	6,243	2,634	3,506	790	13,173	5.00
Total	457,564	197,908	101,858	75,541	25,051	400,358	4.79‡

*Commercial waste of 1.4 lbs. per capita per day was used.
†Collected and disposed of by city, county, or private menas.
‡Total x 2000 ÷ 365 ÷ population.

Source: Spindletop Research, Inc.

The factor used to calculate the volume of bulk waste (refrigerators, stoves, Christmas trees, etc.) was 0.3 pounds per person per day. *

The most difficult type of solid waste to calculate is industrial waste. One reason is that industries produce a wide range of wastes, of which a great deal is collected by private firms. Also, industries dispose of about 45 percent of the total industrial solid waste. To determine the volume of industrial solid waste in the BGADD, the number of employees in each Standard Industrial Classification (SIC) plus industrial solid waste figures for each industrial group were used. †

Table 8 lists the amount of industrial solid waste generated per county. Of the industrial solid waste generated, an average of 45 percent of the total (167,870 tons) is collected from industry and disposed by city, county or private disposal operations. Forty-five percent of 167,870 tons yields the 75,541 tons given in Table 7.

Calculations for all types of solid wastes were cross-checked by field observations of volumes collected and landfilled plus data from Lexington and Frankfort weigh-in stations. The weigh-in stations only recorded solid waste collected primarily by cities and disposed of by incineration. Noncombustible solid waste, such as bulky items, were not recorded.

*Ibid.
†Ibid.

Table 8
Industrial Solid Waste (tons per year)–BGADD, 1970

SIC Number	Description	Counties								
		Anderson	Bourbon	Boyle	Clark	Estill	Fayette	Franklin	Garrard	Harrison
20	Food & Kindred Products	1,388	281	411	551	27	4,913	7,344	40	809
21	Tobacco Manufactures						7,376			697
22	Textile Mill Products		174	100						147
23	Apparel		190	169	155	70	237	216	114	34
24	Lumber & Wood Products	693	595		4,337	2,506	7,585	138	4,766	696
25	Furniture & Fixtures	12		1,311	930	12	1,303	629		36
26	Paper & Allied Products			3,063			3,019			
27	Printing & Publishing	82	198	3,210	372	42	6,139	577	74	132
28	Chemicals & Allied Products	32		145	183		430			302
29	Petroleum Refining			161	680		886	201		
30	Rubber & Plastic Products			41	726		4,594			
31	Leather & Leather Products			4,365			97	2,716		
32	Stone, Clay, Glass & Concrete Products	1,182		1,702	65		5,715	111		18
33	Primary Metal Industries				732		30			377
34	Fabricated Metal Products		19	51	1		2,450	1,107		1,225
35	Machinery, Except Electrical		168	180	10		11,241	133		39
36	Electrical Machinery	63		520	700		2,271	37		
37	Transportation Equipment		142		963	9	43	107		
38	Professional, Scientific Instruments						75	418		367
39	Miscellaneous Mfg. Industries	284		2	32		661	262	555	
	Totals	3,736	1,767	15,431	10,437	2,666	59,065	13,996	5,549	4,879

Table 8 (Cont'd)

SIC Number	Description	Jessamine	Lincoln	Madison	Mercer	Nicholas	Powell	Scott	Woodford	SIC Totals
20	Food & Kindred Products	697	422	1,446	535			55	135	19,054
21	Tobacco Manufactures									8,073
22	Textile Mill Products					115				536
23	Apparel	78	112	15	207	175			41	1,813
24	Lumber and Wood Products	440	693	970	131		1,967		415	25,932
25	Furniture & Fixtures	64	81	719				574		5,671
26	Paper & Applied Products			1,164					534	7,780
27	Printing & Publishing	58	25	1,576	141	25	33	24	5,677	18,385
28	Chemicals & Allied Products	25							139	1,256
29	Petroleum Refining									1,928
30	Rubber & Plastic Products			3,522				190		9,073
31	Leather & Leather Products						2,144			9,322
32	Stone, Clay, Glass & Concrete Products	30	25	318	17,586		118	20		26,890
33	Primary Metal Industries			321				129		1,589
34	Fabricated Metal Products		234	146	19	6		570	1	5,829
35	Machinery, Except Electrical			139	6	3		342	6	12,267
36	Electrical Machinery			833	83			579	453	5,539
37	Transportation Equipment		86		4					1,354
38	Professional, Scientific Instruments			724		568			389	2,541
39	Miscellaneous Mfg. Industries			592				650		3,038
	Totals	1,392	1,678	12,485	18,712	892	4,262	3,133	7,790	167,870

Source: Spindletop Research, Inc.

As shown in Figure 9, by the year 2,000, solid waste may jump from 400,358 tons (1970) to one million tons. The projections are based on population projections and expected solid waste per capita increases.

SYSTEM DESIGN

Design Constraints

One of the constraints in designing the solid waste disposal system for the Bluegrass Area Development District was the lack of data on sanitary landfills and transfer stations serving communities with a population under 10,000. Another constraint was that many rural areas and small communities had no collection services and there was no way of determining when collection would begin in these rural areas. However, the disposal system is designed to handle additional rural solid waste that would be brought in from these areas.

Still another constraint was the lack of adequate roads for collection vehicles, especially the larger transfer trailers if transfer stations are included in the system. A study of design loads for various secondary roads and bridges indicates that some roads and structures would be unable to withstand repeated maximum allowable loads. Thus the lack of adequate roads favors a system without transfer stations.

Determining the Number and Location of Sanitary Landfills

In determining the necessary number and types of solid waste operations, quantities of solid waste, hauling distances and the cost of individual operations versus the cost of a regional system all had to be considered in the analysis. In selecting a centrally located sanitary landfill for the entire district, population centers were grouped by using solid waste centroids.* Appendix A shows how a solid waste centroid is calculated for a rural county. The solid waste centroid for the Bluegrass ADD is in Fayette County, which encompasses 38 percent of the district's population. Thus, the starting point for the system design is the Fayette County landfill which would handle about 40 percent of the solid waste generated in the district.

The analysis of haul distances and costs showed that the Fayette County sanitary landfill could serve communities within a 16-mile radius. The area outside this 16-mile radius was then subdivided into quadrants with the area centroid as the center. Solid waste centroids were then developed for each quadrant. Figure 10 shows the centroid for the Bluegrass District and each quadrant. Appendix B shows haul costs, times and distances for various collection vehicles.

Further analysis of sanitary landfill and haul costs, however, indicated that only one sanitary landfill in the four quadrants would be feasible–the one in the southwest quadrant in Boyle County near Danville. At this point, the area in the three other quadrants was subdivided by groups of cities which would minimize combined haul and sanitary landfill costs. Based on this analysis, seven sanitary landfills would be required for the District. The final location of each sanitary landfill is the solid waste centroid for the cities which the sanitary landfill will serve. Figure 11 shows the design of the Bluegrass solid waste disposal system consisting of the seven sanitary landfills.

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*Solid waste centroid is the center of solid waste activity based on solid waste distribution within an area; the approximate location at which haul distances and haul costs would be minimized.

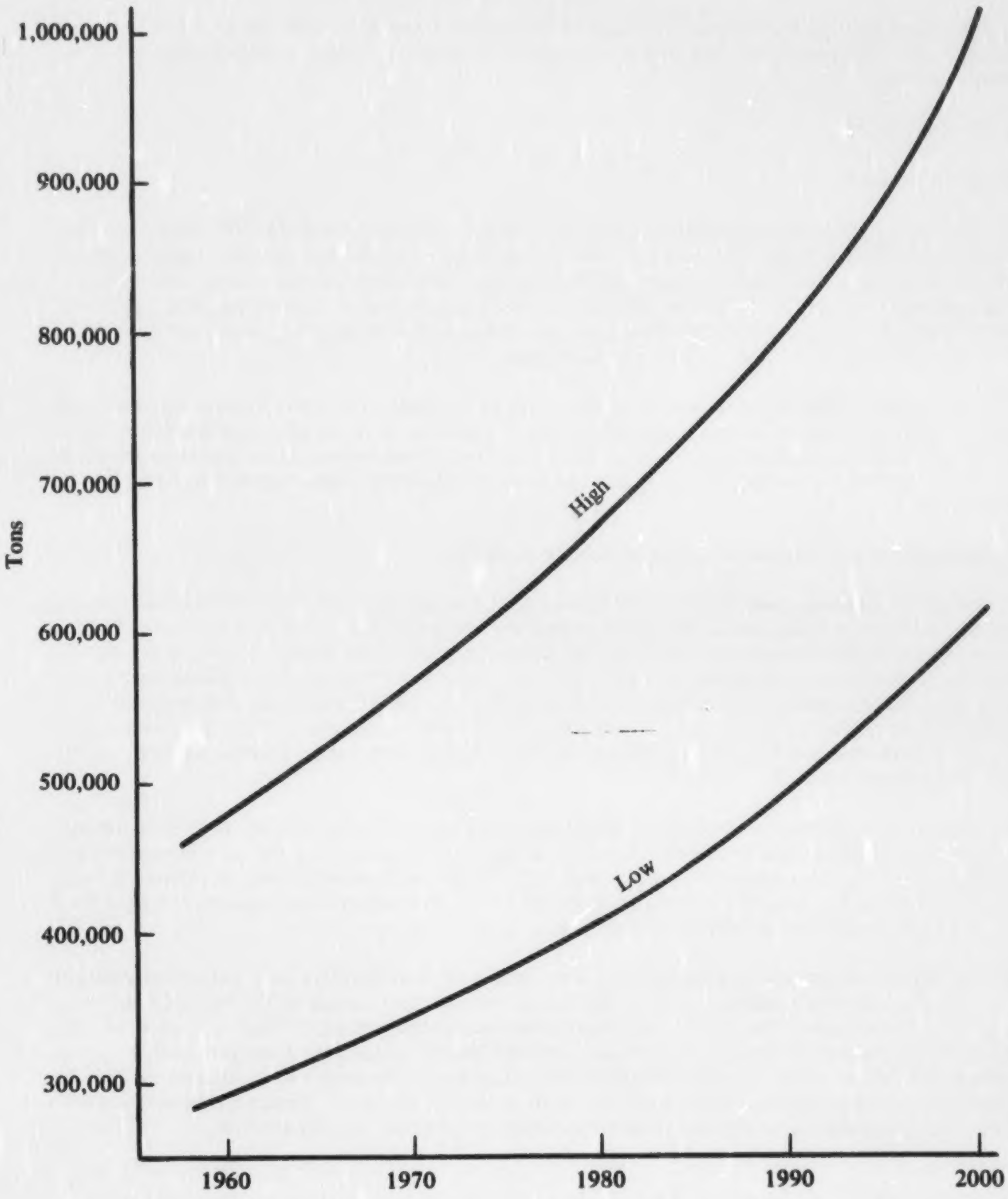

Figure 9. Solid Waste Projections for the Bluegrass Region

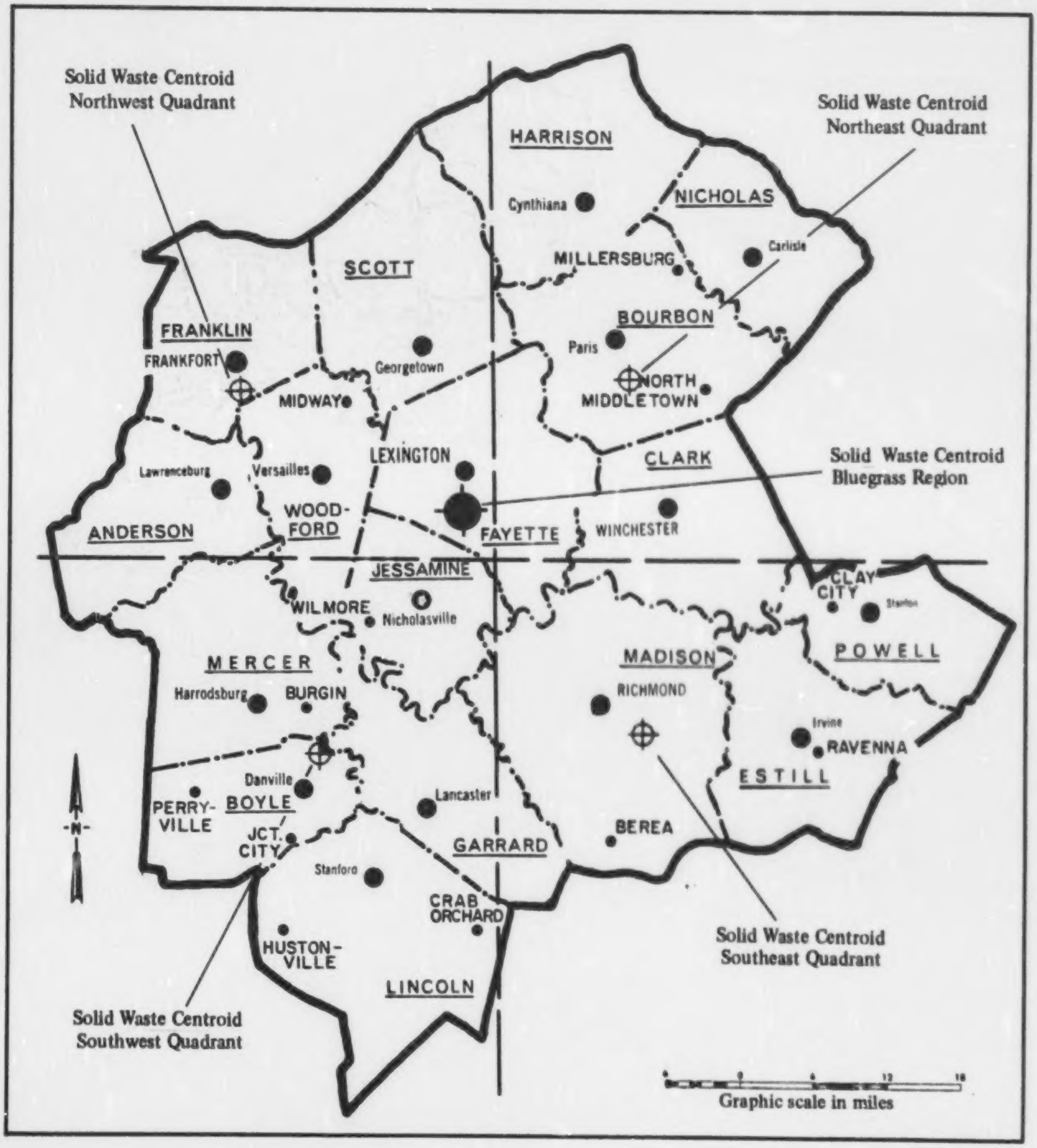
Solid Waste Centroid Northwest Quadrant
HARRISON
Solid Waste Centroid Northeast Quadrant
Cynthiana
NICHOLAS
Carlisle
MILLERSBURG
SCOTT
BOURBON
FRANKLIN
FRANKFORT
Georgetown
Paris
NORTH MIDDLETOWN
MIDWAY
LEXINGTON
CLARK
Solid Waste Centroid Bluegrass Region
Lawrenceburg
Versailles
WOOD-FORD
ANDERSON
FAYETTE
WINCHESTER
JESSAMINE
CLAY CITY
Stanton
WILMORE
Nicholasville
POWELL
MADISON
MERCER
RICHMOND
Harrodsburg
BURGIN
Irvine
RAVENNA
ESTILL
Danville
PERRY-VILLE
BOYLE
Lancaster
N
JCT. CITY
GARRARD
BEREA
Stanford
CRAB ORCHARD
HUSTON-VILLE
Solid Waste Centroid Southeast Quadrant
LINCOLN
Solid Waste Centroid Southwest Quadrant
0
4
8
12
16
Graphic scale in miles

Figure 10. Solid Waste Centroids–BGADD

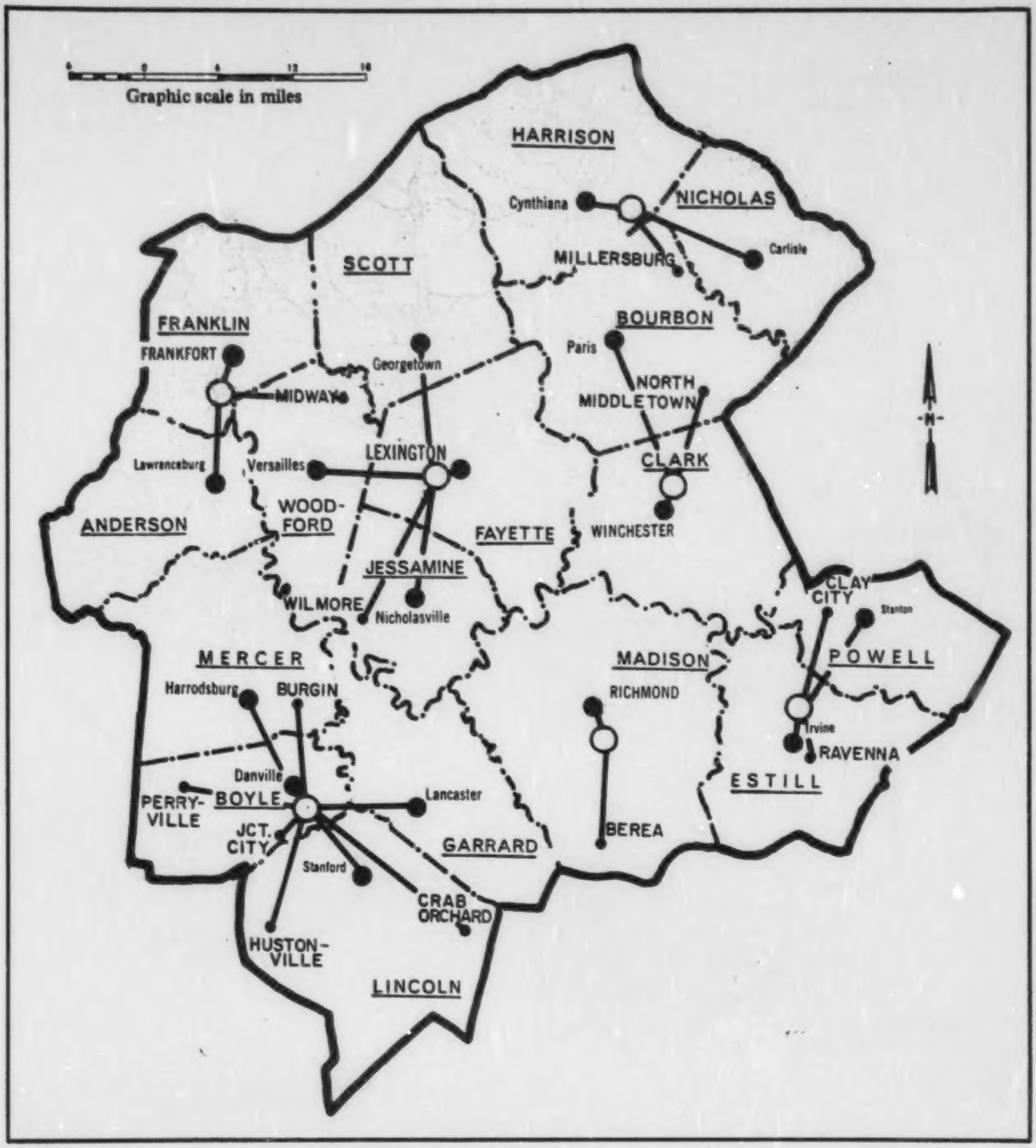
Graphic scale in miles
HARRISON
Cynthiana
NICHOLAS
Carlisle
MILLERSBURG
SCOTT
BOURBON
Paris
FRANKLIN
FRANKFORT
Georgetown
NORTH
MIDDLETOWN
MIDWAY
LEXINGTON
CLARK
Lawrenceburg
Versailles
WOOD-
FORD
ANDERSON
FAYETTE
WINCHESTER
JESSAMINE
WILMORE
Nicholasville
CLAY
CITY
Stanton
MADISON
POWELL
MERCER
Harrodsburg
BURGIN
RICHMOND
Irvine
RAVENNA
Danville
BOYLE
PERRY-
VILLE
Lancaster
JCT.
CITY
ESTILL
GARRARD
BEREA
Stanford
CRAB
ORCHARD
HUSTON-
VILLE
LINCOLN
N

Figure 11. Proposed Bluegrass District Sanitary Landfill System

LAND, EQUIPMENT AND MANPOWER REQUIREMENTS

Generally, the major portion of the initial sanitary landfill investment is for the purchase of land and equipment. However, if the land is financed for the life of the sanitary landfill, then the annual cost of the land is usually not a major item. Personnel costs make up from 40 to 50 percent of the total annual cost; equipment maintenance and operation from 30 to 40 percent. Minimum land area requirements for a five-year life of a sanitary landfill for each of the seven sanitary landfills are shown in Table 9. The table also illustrates equipment and personnel requirements for a five-year life for each sanitary landfill.

The land area required is dependent upon the type and quantities of solid waste, the efficiency of compaction of the solid waste, the depth of the fill, and the desired life of the sanitary landfill.

The size, type and amount of equipment required at a sanitary landfill depend upon the size and method of operation. The tonnage of solid waste handled governs the required flywheel horsepower and weight of equipment.

One equipment operator is needed for the smaller sanitary landfills. However, for Lexington two equipment operators, a driver, recorder and helper are needed.

Cost Analysis*

Because adequate design and operating cost information is not available for small communities, an economic evaluation of sanitary landfills for small communities had to be performed before conducting the actual system analysis. Table 10 illustrates the annual cost for sanitary landfills serving populations to 25,000. An example of costing a sanitary landfill for a city with a population of 5,000 is given in Table 11. The costs in both tables were calculated by using the data and procedures in Appendix C, "Sanitary Landfill Economics."

Table 12 shows the haul costs and disposal costs for sanitary landfills if each jurisdiction operated its own solid waste disposal operation. Table 13 shows the cost if they combined operations into the proposed system design for the Bluegrass District. The total annual cost of individual operations is $929,161; the total cost for the regional system is $516,459. The cost for disposing of a ton of solid waste ranges from $1.36 to $67.31 for individual operations as compared to a range from $1.36 to $5.32 for the regional system. To make a valid economic comparison, all capital costs had to be standardized on an annual-cost basis. Standardizing all costs is difficult because of the various methods that can be used to finance capital cost of equipment, land and facilities. The various financing alternatives do not alter the fact that most cities and counties in the Bluegrass Region can usually benefit by combining their disposal programs. For example, a city may pay a minimum of $20,000 for a bulldozer. But through a joint or regional system–consisting of two small cities-the cost would be shared equally. Such cost benefits make a regional approach more attractive than a single operation.

OPERATION AND MAINTENANCE

A sanitary landfill is of little value unless it is operated and maintained properly. It requires a comprehensive plan which details routine procedures and anticipates abnormal situations.

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*Costs are based on quotations as of November 30, 1970.

Table 9
Land, Equipment and Personnel Requirements–Bluegrass Solid Waste Disposal System

Sanitary Landfill Location	Minimum Land Requirements for 5 Years	Crawler Loader(s) Flywheel Horsepower	Personnel
Lexington Fayette County Georgetown Nicholasville Versailles Wilmore	80 acres	325-450	2 Equipment Operators 1 Recorder 1 Driver 1 Helper
Frankfort Lawrenceburg Midway	13 acres	105-150	1 Equipment Operator 1 Helper
Perryville Hustonville Danville Harrodsburg Lancaster Junction City Crab Orchard Burgin	14 acres	110-175	1 Equipment Operator 1 Helper
Winchester Paris North Middletown	11 acres	105-140	1 Equipment Operator 1 Helper
Richmond Berea	12 acres	105-150	1 Equipment Operator 1 Helper
Cynthiana Carlisle Millersburg	5 acres	85-110	1 Equipment Operator
Irvine Stanton Clay City Ravenna	4 acres	85-110	1 Equipment Operator

Source: Spindletop Research, Inc.

Table 10
Annual Cost and Cost Per Ton of Sanitary Landfills Serving Populations to 25,000

Population	Annual Cost*	Cost/Ton†
Minimum	$19,800	--
1,000	20,600	$34.30
2,000	21,300	17.20
3,000	22,000	11.80
4,000	22,700	9.16
5,000	23,400	7.49
6,000	23,900	6.42
7,000	24,400	5.62
8,000	24,900	5.02
9,000	25,400	4.55
10,000	25,800	4.03
15,000	33,900	3.67
20,000	35,600	2.86
25,000	37,100	2.36

*Does not include haul cost and administrative cost.

†Varies according to the actual tonnage.

Source: Spindletop Research, Inc.

Table 11
Sanitary Landfill Cost–City of 5,000 Population

	Sanitary Landfill Cost	
	Capital	Annual
Engineering Services	$ 1,500	$ 300
Land, Legal fees	2,500	500
Personnel	--	10,000
Equipment and Attachments	23,400	5,300
Equipment Maintenance and Operation	--	3,600
Access Roads	3,800	760
Facilities (Trailer and Shed)	6,500	1,300
Utilities	1,000	740
Fences	2,500	500
Landscaping	500	100
Miscellaneous	1,000	300
Totals	$42,700	$23,400*

*Does not include haul cost and administrative cost.

Source: Spindletop Research, Inc.

The plan describes how the sanitary landfill should be constructed, operated and maintained to conform with the design requirements. The plan also describes: operational personnel requirements; hours of operation; weighing procedures; traffic flow and unloading procedures; waste handling procedures; excavation and placement of cover material; procedures for maintenance of facilities and equipment; adverse weather operating procedures; nuisance control; and emergency operating procedures.

Table 12
Solid Waste Disposal and Haul Costs, BGADD
(Individual Operation)

	Population	Tons/Year	Haul-Round Trip Distance	Haul-Round Trip Time	Haul Cost $/Ton	Haul Cost Annual	Disposal Cost Annual	Haul and Disposal Cost $/Ton	Haul and Disposal Cost Annual
Lexington	108,137	96,702	6	9	$0.40	$38,681	$ 92,900	$1.36	$131,581
Fayette County	66,186	59,187	8	12	0.50	29,594	58,300	1.48	87,894
Georgetown	8,629	6,457	12	23	1.00	6,457	25,400	4.93	31,857
Nicholasville	5,829	4,106	16	32	1.40	5,748	23,900	7.22	29,648
Versailles	5,679	5,182	4	9	0.20	1,036	23,900	4.81	24,936
Wilmore	3,466	2,442	4	9	0.40	977	22,700	9.69	23,677
Total	197,926	174,076				$82,493	$247,100	$1.89	$329,593
Perryville	730	729	2	5	$0.20	$ 146	$ 20,600	$28.45	$ 20,746
Hustonville	413	295	2	5	0.20	59	19,800	67.31	19,859
Danville	11,542	11,522	4	9	0.40	4,608	25,800	2.63	30,408
Harrodsburg	6,741	8,070	2	5	0.20	1,614	24,400	3.22	26,014
Lancaster	3,230	3,012	5	12	0.50	1,506	22,000	7.80	23,506
Stanford	2,474	1,765	5	12	0.50	883	22,000	12.96	22,883
Junction City	1,046	1,044	3	7	0.30	313	20,600	20.03	20,913
Crab Orchard	861	614	2	5	0.20	123	20,600	33.75	20,723
Burgin	1,002	1,200	2	5	0.20	240	20,600	17.36	20,840
Total	28,039	28,251				$9,492	$196,400	$ 7.28	$205,892
Frankfort	21,356	19,760	6	12	$0.50	$ 9,880	$35,600	$ 2.30	$45,480
Lawrenceburg	3,579	3,037	2	5	0.20	607	22,700	7.67	23,307
Midway	1,278	1,166	4	9	0.40	466	20,600	18.06	21,066
Total	26,213	23,963				$10,953	$78,900	$3.74	$89,853
Winchester	13,402	11,569	2	5	$0.20	$2,314	$33,900	$3.13	$36,214
Paris	7,823	5,582	4	9	0.40	2,233	24,900	4.86	27,133
North Middletown	433	309	2	5	0.20	62	19,800	64.27	19,862
Total	21,658	17,460				$4,609	$78,600	$4.76	$83,209

Table 12 (Cont'd)

	Population	Tons/Year	Distance-Round Trip Distance	Time	Haul Cost $/Ton	Annual	Disposal Cost Annual	Haul and Disposal Cost $/Ton	Annual
Richmond	16,861	14,739	4	9	$0.40	$5,896	$33,900	$2.70	$39,796
Berea	6,956	6,081	2	5	0.20	1,216	24,400	4.21	25,616
Total	23,817	20,820				$7,112	$58,300	$3.14	$65,412
Cynthiana	6,356	5,231	2	5	$0.20	$1,046	$23,900	$4.76	$24,946
Carlisle	1,579	1,153	2	5	0.20	231	21,300	18.67	21,531
Millersburg	788	562	1	5	0.20	112	20,600	36.85	20,712
Total	8,723	6,946				$1,389	$65,800	$9.67	$67,189
Irvine	2,918	2,226	12	25	$1.10	$2,449	$22,000	$10.98	$24,449
Stanton	2,037	1,870	1	5	0.20	374	21,300	11.59	21,674
Clay City	983	902	3	7	0.30	271	20,600	23.13	20,871
Ravenna	784	598	8	16	0.70	419	20,600	35.14	21,019
Total	6,722	5,596				$3,513	$84,500	$15.72	$88,013

Source: Spindletop Research, Inc.

Table 13
Solid Waste Disposal and Haul Costs, BGADD
(Regional Operation)

	Haul-Round Trip		Haul Cost		Disposal Cost	Haul and Disposal Cost	
	Distance	Time (Min.)	$/Ton	Annual	Annual	$/Ton	Annual
Lexington	6	9	$0.40	$38,681			
Fayette County	8	12	0.50	29,594			
Georgetown	24	34	1.50	9,686			
Nicholasville	34	49	2.20	9,033			
Versailles	28	41	1.80	9,328			
Wilmore	36	51	2.30	5,617			
Total				$101,939	$135,200	$1.36	$237,139
Frankfort	6	12	$ .50	$ 9,880			
Lawrenceburg	18	34	1.50	4,556			
Midway	28	39	1.70	1,982			
Total				$16,418	$37,100	$2.23	$ 53,518
Perryville	24	32	$1.40	$ 1,021			
Hustonville	28	39	1.70	502			
Danville	4	9	0.40	4,609			
Harrodsburg	18	23	1.00	8,070			
Lancaster	24	32	1.40	4,217			
Stanford	22	28	1.20	2,118			
Junction City	16	25	1.10	1,148			
Crab Orchard	40	54	2.40	1,474			
Burgin	18	28	1.30	1,560			
Total				$24,719	$37,400	$2.19	$62,119
Winchester	6	12	$ .50	$ 5,785			
Paris	22	33	1.45	8,094			
North Middletown	18	28	1.20	3.71			
Total				$14,250	$35,900	$2.87	$50,150

Table 13 (Cont'd)

	Haul-Round Trip		Haul Cost		Disposal Cost	Haul and Disposal Cost	
	Distance	Time (Min.)	$/Ton	Annual	Annual	$/Ton	Annual
Richmond	8	16	$ .70	$10,317			
Berea	16	25	1.10	6,689			
Total				$17,006	$36,400	$2.56	$53,406
Cynthiana	4	9	$ .40	$2,092			
Carlisle	28	39	1.70	1,960			
Millersburg	24	37	1.60	899			
Total				$4,951	$25,400	$4.36	$30,351
Irvine	8	16	$ .70	$1,558			
Stanton	18	30	1.30	2,431			
Clay City	14	21	.90	812			
Ravenna	10	18	.80	478			
Total				$5,279	$24,500	$5.32	$29,779

Source: Spindletop Research, Inc.

V. THE BLUEGRASS SOLID WASTE DISPOSAL CORPORATION

ASSESSMENT OF TASK

From the outset, gaining participation of local jurisdictions was recognized as the most difficult task in organizing the Bluegrass solid waste management system. And as the demonstration proceeded, the task became increasingly complex.

Spindletop's approach to the problem was aimed toward gaining support from the chief elected official (county judge and mayor) of each county and city. It included assessing each official's awareness of the solid waste problem, his role in the solution of the problem, his interest in solving the problem, and his willingness to participate in the demonstration. Beyond this, each official was expected to serve as the liaison between the Spindletop demonstration staff and legislative bodies and residents of jurisdictions. Such a concept looked sound on paper but proved to be unrealistic.

For one thing, of the 46 public officials initially contacted, 40 were rated as "interested" in solid waste problems and the demonstration, four were "unconcerned", and two were definitely "not interested" and would not make appointments to discuss the subject. Also, many of the public officials who initially expressed interest and willingness to participate in the demonstration failed to transmit information to their legislative bodies and publics. This fact was brought out during Spindletop staff meeting with legislative bodies and local groups and organizations. During the course of this project, over 225 discussions were held with public officials alone.

In all, 20 mayors and judges signed the initial *Statement of Interest* to receive federal funds for the demonstration. But of these 20 officials, eight were not reelected to office. In addition, when officials realized there would be no grant funds for actual operation during the first year, interest decreased substantially.

One final point. Although financial benefits of inter-jurisdictional cooperation may be apparent, they do not always serve as sufficient motivation for a city or county to enter into a joint effort. For example, one city that operates its own landfill refused to join a cooperative venture because it would lose control of the operation. Also, since many of the counties (12 of 17) do not operate their own disposal sites, some counties are reluctant to enter into any agreement which would make them responsible for solid waste disposal. In fact, one county judge stated that garbage disposal was the city's problem and he did not and would not become involved.

ESTABLISHMENT OF MANAGEMENT SYSTEM

Corporate Organization

On July 6, 1970, the Articles of Incorporation for the Bluegrass Solid Waste Disposal Corporation, a nonprofit organization, were filed with the Secretary of State of Kentucky. The articles were essentially those as drafted by Spindletop with minor revisions suggested by several local officials. A copy of the articles is presented in Appendix D.

The initial board of directors named in the articles consisted of the Fayette County judge, the mayor of Georgetown, a private hauler operating in Fayette County, the executive director of the Bluegrass Regional Health Planning Council, and the city manager of Danville. The initial board was to serve until the annual meeting of the corporation, at which time a full operating board would take office as provided in the bylaws. A copy of the bylaws is presented in Appendix E.

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Alternate bylaw provisions were circulated to public officials. When these suggested bylaws of the corporation were discussed with the officials, little interest was expressed–even though the bylaws specified the composition of the board of directors and the method of selection of board members. Most officials were interested in when they would benefit from a solid waste disposal corporation, not in the mechanics of forming the organization.

The organizational meeting of the initial directors was held on October 29, 1970. At the meeting, the bylaws were adopted and a chairman and officers were elected. The bylaws adopted were those recommended by Spindletop; they provide that each jurisdiction interested in participating, as well as other user groups, would have board representation. They also specify that any jurisdiction desiring representation on the board could designate a board member by filing a letter of intent to participate in the disposal operations of the Corporation. These letters of intent–a copy of which is presented in Appendix F–were sent to each jurisdiction before the annual meeting. Nineteen of the 46 jurisdictions executed these documents. These jurisdictions were:

- County

    - Bourbon
    - Boyle
    - Estill
    - Fayette
    - Franklin
    - Nicholas
    - Scott

- City

    - Berea
    - Burgin
    - Carlisle
    - Cynthiana
    - Danville
    - Frankfort
    - Irvine
    - Millersburg
    - Nicholasville
    - Paris
    - Stanford
    - Winchester

The annual meeting of the Board was held on November 30, 1970. At the meeting, a chairman, an executive committee, and officers were elected. The Board also passed a resolution requesting and authorizing Spindletop to seek funding for implementation of the sanitary landfill operations to be conducted by the Corporation. In addition, Spindletop recommended that phased implementation of the sanitary landfill system begin in the northeast segment of the Bluegrass District, since six of eight jurisdictions located there showed a unified interest in the Corporation by placing a representative on the board. The segment comprises Bourbon, Harrison and Nicholas Counties.

Corporate Structure

The corporate structure of the Bluegrass Solid Waste Disposal Corporation is similar to that employed by private business. Such a structure has several advantages. For one thing, all functions fall under a corporate officer. It also places responsibility for both line and staff functions under the control of the board of directors, its chairman and an executive committee.

Still another advantage is its flexibility. If, for example, the Corporation needs to be enlarged, the structure need not be altered. At the same time, if a smaller corporation is needed, some of the organizational units can be telescoped into others or even eliminated.

Figure 12 shows the organizational structure of the Corporation. In addition to its board of directors, executive committee and president, the Corporation comprises a (1) vice president in charge of solid waste disposal, (2) vice president in charge of urban and rural collection plus maintenance and repair, (3) secretary, (4) treasurer, and (5) legal counsel. A detailed description of the Corporation's organizational structure and the authority, duties and responsibilities of its officers is presented in Appendix G.

Corporate Operating Programs

In addition to the solid waste disposal system of seven sanitary landfills, plans call for the Corporation to operate urban collection systems and a container program for rural areas and highways.

Under the urban collection program, solid waste would be collected from the homes, industries, commercial establishments and institutions of the towns and communities in the District and hauled to the nearest sanitary landfill. The operation envisages the use of packer collection vehicles and minimum manpower.

The rural area and highway container program would provide residents in rural areas with the advantages of the centralized sanitary landfill. Containers would be strategically placed along highways; each would be located to serve a specific segment of the rural population. At various time intervals, containers would be emptied and their contents hauled to a sanitary landfill.

Public and private collection and disposal systems already operate in many communities. As many as possible should be integrated into the corporation's operations. Both public and private operators could join the Corporation with little change in their procedures or methods of operation. They would continue to operate an urban collection system but, instead of using open dumps or other means of disposing of solid waste, they would be encouraged to use the seven sanitary landfills of the Corporation.

Corporate Pricing Policy

The quality of services and pricing policies are two critical factors governing the success of the Corporation. Public acceptance of the Corporation will likewise depend upon these two factors. To prove viable, service prices must be sufficient in the long run to cover all the expenses and to yield a surplus for expansion, but such prices need not be established at the outset.

To obtain community participation at the start up period, the Corporation should consider setting prices of the services below cost. At first glance, such a pricing policy might appear unrealistic; however, from the point of view of behavior of costs, it could prove good business. Solid waste disposal by sanitary landfill is an industry of moderately decreasing costs as the scale of operations increases. The decline in costs as output grows is less pronounced in sanitary landfill operations than it is in industries in which much larger amounts of capital are used. Thus, the per-unit costs of sanitary landfill services tend to decline moderately as the volume of its business increases. This economic principal could serve to dictate the Corporation's pricing policy for its services.

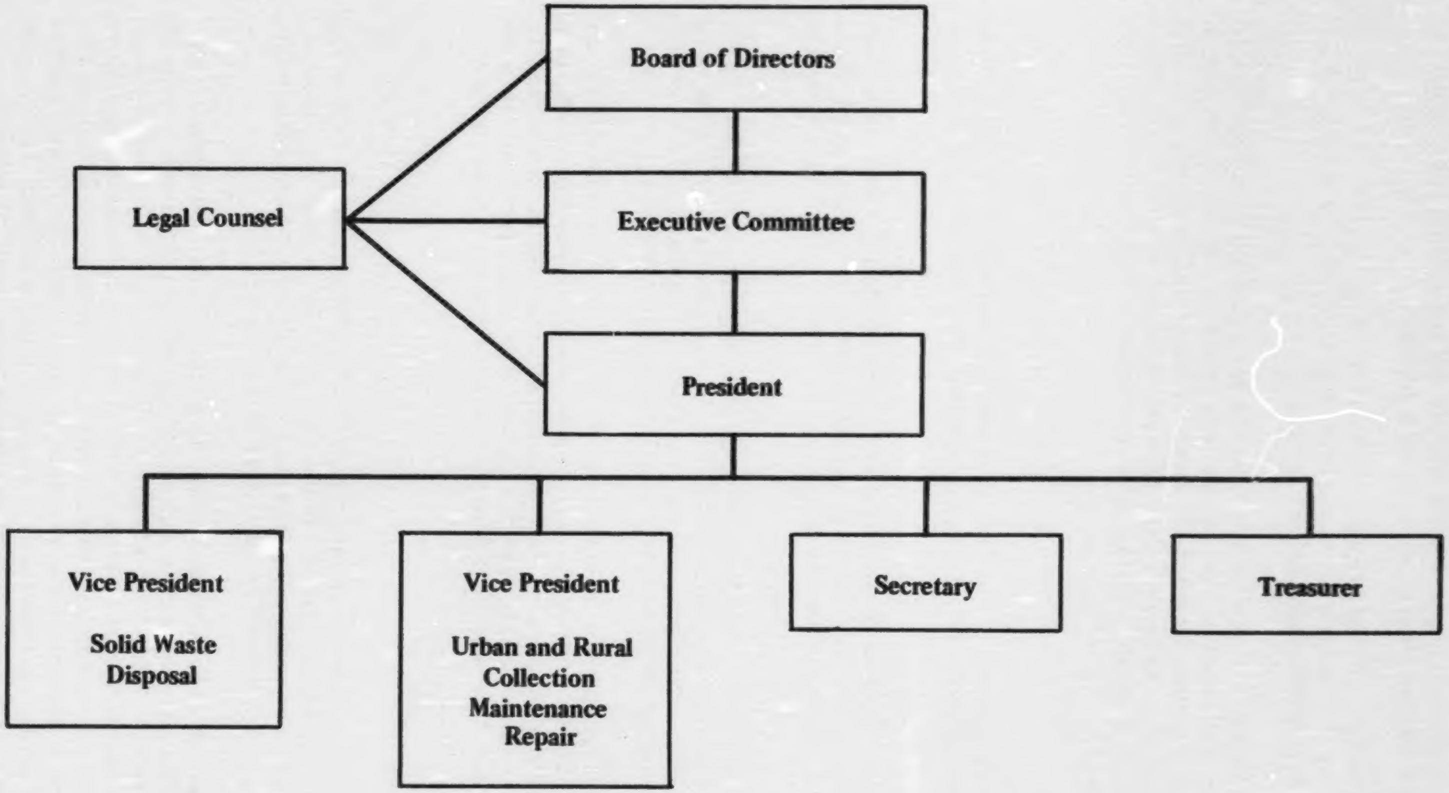
Board of Directors
Legal Counsel
Executive Committee
President
Vice President
Solid Waste
Disposal
Vice President
Urban and Rural
Collection
Maintenance
Repair
Secretary
Treasurer

Figure 12. Corporate Organization–Bluegrass Solid Waste Disposal Corporation when Fully Operational

If pricing below cost appears impractical or if the working capital of the Corporation proves insufficient to sustain the Corporation, prices could be set at cost, or slightly above cost at the start and then, as per-unit costs decline and volume of business increases, service charges to participants could be lowered.

In summary, two principal problems faced by the Corporation in its early stages are pricing and participation. These two problems are closely related. If the prices required to cover costs are too high, participation will suffer and costs will tend to remain above their lowest possible levels. Thus, the Corporation will require sufficient capital to withstand financial pressures that might be encountered during its early years. Later, when its utility has been demonstrated, it can adjust its price policies.

VI. SOURCES OF FINANCING

BASIC PARAMETERS

The Bluegrass solid waste disposal system involves many decisions on methods of operation which, in turn, influence financial considerations. Originally it was believed that the Bluegrass Solid Waste Disposal Corporation (BGSWD)–the system's manager–would serve as a financing vehicle for the system. But when it became clear that the system would comprise seven individual sanitary landfills, it also became clear that the method of financing must be at the operating sanitary landfill level. This change did not alter the BGSWD's role as manager of the system. However, it did require jurisdictions served by a sanitary landfill to form a subsidiary corporate entity for seeking federal, state, local and private financing.

Funds to operate a sanitary landfill, pay debts, acquire equipment, and obtain working capital must ultimately come from those using the facility. The users will be municipal and county governments that contract with the sanitary landfill for solid waste disposal. Private contractors and, to a lesser extent, individuals, will also provide some revenue. Thus the major sources of revenue are governmental entities. This fact simplifies financing, because the responsibility for collection of either fees or taxes rests with local government or private collectors, not the sanitary landfill. Upon execution of disposal contracts, revenue to the sanitary landfill is assured for the life of the contract.

Local governments have a number of alternate methods of acquiring funds to pay the contracted sanitary landfill fees. Among them: general funds, loans, grants-in-aid, service charges or fees, or through a special tax authorized upon formation of a Garbage and Refuse Disposal District under Chapter 109 of the Kentucky Revised Statutes.

These sources of revenue are those available to governments to pay for disposal services offered by the BGSWD Corporation. The immediate concern, however, is how the individual sanitary landfill will raise the capital needed to begin providing services. Funds must be obtained to acquire equipment and land and to develop buildings, utilities, fences and access roads. In addition, working capital must be obtained to maintain equipment and facilities, pay utilities and insurance, meet labor costs, and other expenses and overhead, including the administrative expenses of the BGSWD Corporation.

VARIABLES AFFECTING FINANCING

Financing Structure

Each sanitary landfill will require different methods of financing to meet different problems and to take advantage of local opportunities. As pointed out earlier, separate corporate entities would be created to function as the financing vehicles for each of the seven sanitary landfills. To capitalize and recapitalize the BGSWD Corporation each time a new sanitary landfill operation begins would be unnecessarily complicated. Independent financing of each sanitary landfill means that if one fails, the entire system will not be jeopardized.

Timing

The seven sanitary landfills will not be acquired and equipped simultaneously. The reason is that the commencement of a sanitary landfill operation will depend upon receiving disposal contracts from enough jurisdictions to ensure the required cash flow. Consequently, each sanitary landfill operation not only will be financed but will become operational at different times. And as a result, capital and interest rates will vary from site to site.

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Income

The income flowing to each operation must be sufficient to retire debt plus meet operational expenses and generate a reserve for replacement of equipment having a three year life. Income to a proposed sanitary landfill will be affected by privately operated sanitary landfills. If a private sanitary landfill is operating or is planned, the BGSWD Corporation should evaluate the need for another. Also, the amount of income needed will be partially determined by the amount of debt financing used. The higher the proportion of debt to grant capitalization, the greater the income needed to make principal and interest payments.

Site Availability and Method of Acquisition

Optimum acreage for a sanitary landfill may not be available for lease or purchase. Larger parcels may be required. While leasing is desirable from a capitalization standpoint, purchasing a site may be the only alternative in some areas. Conversely, a site may be donated or it may be leased for less than the fair market value, which varies according to location. These factors are additional reasons why each location will require a separate financial package.

Equipment

In some locations new equipment may have to be obtained by cash purchase, financed purchase, or lease. Elsewhere, a jurisdiction may sell or lease used equipment at a bargain price. Moreover, it might be advisable to lease the operation of a sanitary landfill to a private operator which would dispense with the need to finance equipment.

Ratio of Debt to Grant Capital

A for-profit corporation has access to both debt and equity financing. The BGSWD Corporation and the sanitary landfill corporation, being nonprofit and nonstock, therefore have no access to an equity market. In the nonprofit business sector, grants replace equity capital. Since the amount of debt to incur partially depends on remaining capitalization requirements after grants have been injected, the grant variable must be known before any financial package is formalized. Consequently, a firm grant commitment is desirable before negotiating debt obligations. Since the availability of grant funds at a given time may not coincide with a proposed start-up of a given operation, this source of financing may well affect the time of development.

Let's now consider various methods of financing that could be employed to finance the seven individual sanitary landfills. These methods include leasing, installment purchases, commercial bank loans, bonds, and government grants and subsidies.

LEASING

Many corporations find it desirable to lease required land and equipment. Such practice reserves capital for operations rather than for fixed assets. Many businesses feel that capital employed for working capital or other operational purposes yields higher profits than that employed in the acquisition of fixed assets.

Leased land and equipment can aid a corporation by making it far easier to begin operations without raising large amounts of capital. Even though the equipment and land might be leased, the corporation would still find it necessary to raise the required working capital, possibly through bank loans.

Two kinds of leasing arrangements could be made. Under one arrangement, the corporation never acquires title to the leased equipment and land, but continues to lease these properties indefinitely. Under another leasing arrangement, the corporation pays a larger rental but, at the expiration of the lease, acquires title to the property. Such an arrangement will require higher charges for services. On the other hand, the corporation builds up its assets under this plan and becomes more independent and self-reliant.

Although leasing relieves the corporation from the necessity of raising the funds to purchase land and equipment, someone must either have, or be able to acquire the land and equipment. One solution would be for the equipment to be acquired and leased by a private leasing company. The land could be leased from an individual owner. Also, a state, county, municipal government or public agency could condemn the needed property by using its rights of eminent domain, and then lease to the sanitary landfill corporation.

Instead of depending upon a public body for the leasing arrangement, the corporation could arrange to have a private company purchase the equipment and lease it to the corporation. Private landowners are a good source of land leases. Such an arrangement would obviate the necessity for raising relatively large amounts of capital, but the arrangement may prove more expensive than leasing through a government body, for a private firm must add its profit to the rental payments. For this reason, the corporation should go to private leasing arrangements only after investigating leasing from public bodies.

INSTALLMENT LOANS

As pointed out earlier, the corporation might purchase its equipment from suppliers on the installment plan. It could also acquire land and buildings under a reducible mortgage plan which is, in effect, an installment plan. Under both plans, the corporation must make a down payment which could amount to from one-fourth to one-third of the value of the land and equipment.

The funds needed for a down payment could be raised in a variety of ways. One method would be through conventional short-term bank loans. Another would be loans from parties interested in establishing and operating the corporation. A third source would be grants from federal and state and local agencies. A combination of these could also be used.

The interest rates of installment loans are apt to be from two to three times higher than those of conventional loans. For this reason, leasing, or lease-purchase arrangements, would likely prove cheaper.

COMMERICAL BANK LOANS

A local solid waste disposal corporation, with an assured source of revenue, and performing a quasi-public function, is in a good position to negotiate term loans with a small syndicate or a consortium of local commerical banks.

As in the case with lease-purchase arrangements, service charges must be sufficient to meet the interest and principal of the loan. After the loan has been paid, the equipment would belong to the corporation, debt-free.

All land, building and working capital of the corporation, of course, could not be acquired through term loans. Before starting operations, the corporation would need additional funds. Since the corporation operates in the public interest, it should apply for grants from the federal government, state, counties and municipalities in the district which it serves. If grants cannot be obtained, short-term loans might be available from these bodies. Failing this, it could turn to citizens served by the Corporation.

BONDS

Raising funds through bonded debt or other publicly offered debt obligations is difficult, for a small, private, not-for-profit corporation at the "start up" stage. For one thing, such issues are usually small and lack broad appeal. Since the issuing corporations are essentially local, the market for their obligations is also local. Furthermore, the lack of a wide market means that the liquidity of these obligations is limited. In other words, it may be difficult for a holder to sell these securities on short notice and for a fair price.

These drawbacks do not mean, of course, that a solid waste disposal corporation cannot successfully float debt issues. It does mean, though, that such issues can only be floated at relatively high interest rates and frequently only to local public-spirited citizens. Under certain conditions, bonds of a private nonprofit corporation can be issued as tax exempt, which would help reduce the interest rates. In any event, the type of facilities and equipment required does not require the use of bonds. Most of the sanitary landfill equipment has an estimated optimum life of three years, and the sanitary landfill life runs until the site has been filled.*

Only if a large tract of land were to be purchased for sanitary landfill use over a long term would the use of bonds be advisable. Also, if large, expensive, and permanent facilities and equipment, such as transfer stations or large shredders or compacters, were later added to a collection function of the system, then a bonded debt may need to be considered. At present, however, when considering that the immediate function of the corporation is disposal only, that land can likely be leased, and that the necessary equipment has a short life, one must conclude that bonds would not be an appropriate method of financing.

GOVERNMENT GRANTS, SUBSIDIES AND LOANS

A not-for-profit solid waste disposal corporation performing a quasi-governmental function is eligible for public loans, grants, and subsidies of various types. Some potential sources of financing include the Farmers Home Administration, the Environmental Protection Agency, and the Small Business Administration.

Farmers Home Administration

The Farmers Home Administration (FmHA) offers a grant and loan program for the development of solid waste disposal facilities in rural areas. This program, Water and Waste Disposal Systems for Rural Communities, provides grants up to 50 percent of the development cost and loans for the remainder of the cost. Before establishing definite financing plans, the corporation should apply for each type of assistance available under FmHA programs.

Environmental Protection Agency

A nonprofit solid waste disposal corporation qualifies for financial assistance from the Environmental Protection Agency (EPA) solid wastes deomonstration grants. At present, all such grants are for new and unique disposal methods and do not provide for general construction. Negotiations with the appropriate EPA office should be made before a corporate financial plan is established.

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*Three year optimum life is based on factors of maintenance and trade-in value of equipment.

Small Business Administration

Various Small Business Administration (SBA) loan programs can be used by a nonprofit corporation, if the loan benefits an identified profit-making small business. To qualify, the corporation would be required to function as an SBA 502 local development corporation, whereby it would acquire the sanitary landfill facilities and equipment, and then lease, license or franchise them to a businessman who would operate the sanitary landfill at a profit.

Moreover, allowing a small businessman to operate the sanitary landfill would open up various other SBA programs available only to individual businessmen. The lease guarantee plan is one example.

The corporation could also decide to license the sanitary landfill operation by leasing the site and assigning the disposal contracts to a businessman who might use the license as security to finance his own equipment. Or the businessman may already have the necessary equipment, labor and maintenance facilities as part of a private contracting or excavating operation. In this case, corporate financing of equipment would not be necessary.

One point that should be considered is that the private operator's profit might increase the cost of the disposal services. On the other hand, a private operator might be able to carve out a profit charging the same rates the nonprofit corporation would require. However, if the sites were leased to private operators, administrative and overhead costs of the BGSWD Corporation would be reduced, and the savings could accrue to them as profits.

SUMMARY

In summary, an individual sanitary landfill should incur the smallest amount of debt possible by concentrating on subsidies, grant programs, and land and equipment leasing. The revenue from the operations must be sufficient so that it will meet expenses and eliminate debt while it accumulates a reserve for replacement and contingencies. The intent is to place the sanitary landfill operation on a stable, pay-as-you-go basis, so that any additional capital needed can be generated from internal cash flow.

The reduction or elimination of short term debt has advantages of lessening the dangers of bankruptcy and giving the the corporate management greater independence and freedom of operation. While eliminating all debt has its advantages, it would also result in the need to charge higher prices, particularly if a low volume of waste is experienced. As a result, some long term debt may have to be carried. But one should remember that the regulatory environment, as well as disposal technology, is changing too fast to initially risk a large long-term bonded indebtedness for a method of disposal that could become functionally or legally obsolete before the debt is paid.

When the sanitary landfill sites show a history of successful operation through inter-jurisdictional cooperation, and when large sums of capital are needed for large land purchases, or purchase of permanent facilities and equipment for a collection function, then long term bonded or mortgaged indebtedness would be appropriate vehicles. Such acquisitions could not be financed on a short-term basis out of customer billings without charging excessive rates. The key to any financial plan--whether based on long-term or short-term methods of financing--is obtaining multi-jurisdictional cooperation. Only when this occurs will there be sufficient cash flow to support the financing of a regional system.

VII. IMPLEMENTATION

ESTABLISHMENT OF FINANCING AGENT

Upon completion of the tasks required under the contract–the design of the solid waste disposal system, the design of a Bluegrass Solid Waste Disposal Corporation (BGSWD), and the identification of sources of financing–Spindletop found that additional work would be needed to keep the program moving toward reality. In turn, the BGSWD Corporation requested Spindletop's assistance in seeking funds for the first sanitary landfill which would be located in the northeast section of the District. The sanitary landfill would serve three counties–Bourbon, Harrison and Nicholas–and five cities–Paris, Carlisle, Cynthiana, North Middletown and Millersburg.

During the course of seeking funds for the first sanitary landfill, the Farmers Home Administration (FmHA) suggested that a separate entity be formed at the local tri-county level to serve as the financing vehicle. Such an organization, FmHA felt, not only would reflect local participation in the sanitary landfill by the three counties which it would serve, but it would also identify the beneficiaries of the grant and loan. The request also reinforced Spindletop's recommendation that a separate financial vehicle be set up for each sanitary landfill because timing and the method of financing will vary in each case.

To meet these recommendations, the Bourbon-Harrison-Nicholas Solid Waste Disposal Corporation was chartered to finance the sanitary landfill for the three counties as shown in Figure 13. This Corporation and the BGSWD Corporation have interlocking boards of directors; the Bourbon-Harrison-Nicholas board is a subset of the Bluegrass board. The BGSWD Corporation, however, will still maintain responsibility for managing solid waste operations, including administration and operation of the sanitary landfills. The operation of the sanitary landfills will be through contract from the landfill corporations to the BGSWD Corporation. Articles of Incorporation and the bylaws for the Bourbon-Harrison-Nicholas Solid Waste Disposal Corporation are presented in Appendices H and I, respectively.

INITIAL OPERATIONS OF BGSWD CORPORATION

Since the initial operation of the BGSWD Corporation will be confined to a three-county area, the Corporation's organizational structure was modified, or scaled down, so it could operate realistically and effectively. In addition, a plan was developed for financing the initial operations.

Restructure of BGSWD Corporation

Figure 14 shows the new organizational structure for the BGSWD Corporation. In addition to the board of directors and executive committee which were not modified, officers include the president, one vice president, and secretary/treasurer. The Corporation will employ an executive director, secretary-bookkeeper, bulldozer operator, and recorder. A description of their duties follows:

Executive Director

The Director will be responsible for the operation of the Corporation. He must be first an administrator, knowledgable in business administration and public relations, and second a technician knowledgeable in civil or sanitary engineering. The success of the Corporation depends upon the effectiveness of the director in expanding operations into the other jurisdictions of the District.

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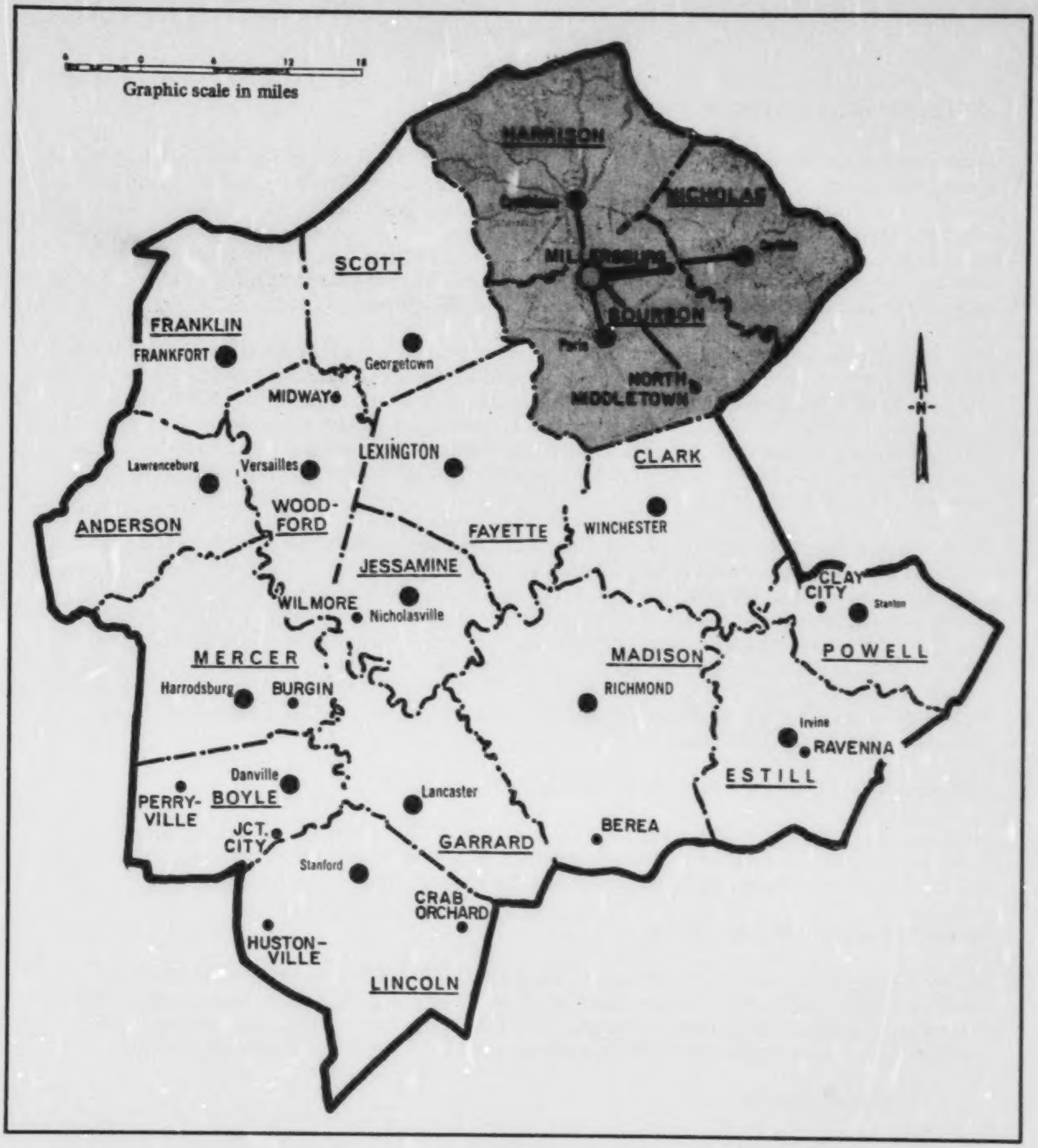

6 0 6 12 18
Graphic scale in miles
HARRISON
Cynthiana
NICHOLAS
Carlisle
MILLERSBURG
BOURBON
Paris
NORTH MIDDLETOWN
SCOTT
Georgetown
FRANKLIN
FRANKFORT
MIDWAY
LEXINGTON
Versailles
Lawrenceburg
CLARK
WOOD-FORD
ANDERSON
FAYETTE
WINCHESTER
JESSAMINE
WILMORE
Nicholasville
CLAY CITY
Stanton
POWELL
MERCER
MADISON
Harrodsburg
BURGIN
RICHMOND
Irvine
RAVENNA
ESTILL
Danville
PERRY-VILLE
BOYLE
Lancaster
JCT. CITY
GARRARD
BEREA
Stanford
CRAB ORCHARD
HUSTON-VILLE
LINCOLN
N

Figure 13. Bourbon, Harrison, Nicholas Counties' Sanitary Landfill

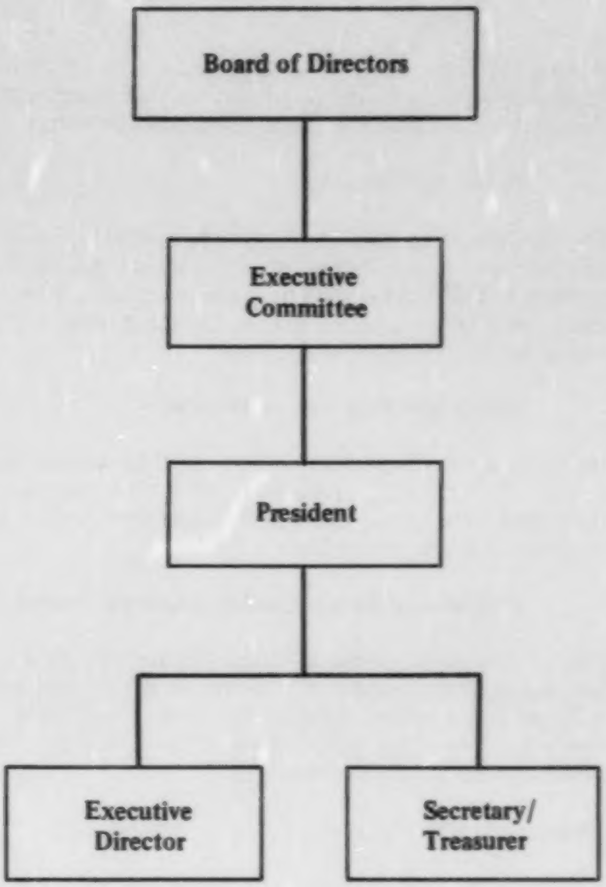

Figure 14. Corporate Organization–Bluegrass Solid Waste Disposal Corporation (Initial Operation)

Secretary–Bookkeeper

The secretary-bookkeeper will perform secretarial functions such as typing and filing. In addition, this employee will be responsible for maintaining corporate books and accounts.

Bulldozer Operator

The bulldozer operator will be responsible for the physical operation of the sanitary landfill. He must be skilled in the operation of the equipment and the proper operation of a sanitary landfill.

Recorder

The recorder will be responsible for maintaining the daily record of users, quantities of solid waste entering the site and fees collected. The recorder will also provide backup for the bulldozer operator.

Consulting Requirements

From time to time, the Corporation will require outside consulting services. Among them: a registered professional engineer, legal counsel, a certified public accountant, repair and maintenance services and professional planning and management assistance.

Consulting Engineer

Before operations begin, the services of a registered professional engineer will be required to design the sanitary landfill. The engineer will also be used as engineering problems arise. The financial arrangements will depend upon the demand the Corporation makes of his services. It might be expedient to utilize his services on a retainer basis.

Legal Services

The Corporation will require the services of legal counsel from time to time. If the Corporation becomes involved in litigation, such services would be essential. Legal counsel will also be required when contracts are drafted and negotiated, when the purchase or lease of important parcels of real estate is made, when assistance is needed for collecting delinquent accounts, and when activities involve the legal rights of others. Legal counsel could be engaged on a retainer or as-used basis, depending upon the volume of legal advice which may be required. It might prove advisable for the Corporation to designate a legal counsel at the outset.

Public Accountant

The services of an outside accounting firm will be required, at least annually, to audit accounts. For this purpose, a certified public accountant who can issue a legally valid audit certificate would be preferred. The audit should be made for the benefit of the public, customers of the Corporation and those who have invested money or other assets in the Corporation. The accountant should be employed upon an as-used fee basis.

Repair and Maintenance Services

At present, the Corporation is too small to warrant the establishment of a repair and maintenance service. Nevertheless, equipment will require periodic servicing to extend its life and to minimize downtime. The repair and maintenance work would be performed by outside firms, which can be retained on a job-per-job basis.

Professional Planning and Management Assistance

One of the major programs planned during the first year of operation will be the design of a rural area and highway container program. Designing the system and determining the method of financing will require qualified solid waste system personnel. Also, the Corporation plans to expand its operation into other parts of the District. To do this, the Corporation will require assistance in designing and developing each site.

Financial Plan*

The methods and sources of financing are critical to the success of the BGSWD Corporation. The immediate concern, as pointed out in "Sources of Financing," is how the individual sanitary landfill will raise the capital needed to begin operations. Funds must be obtained to acquire equipment and land and to develop buildings, utilities, fences, and access roads. In addition, working capital must be obtained to maintain equipment and facilities, pay utilities and insurance, meet labor costs, and other expenses including the administrative expenses of the BGSWD Corporation.

To obtain these needed funds, not only must various methods of financing be considered–debt, leasing and grants, but the expenses required must be identified. A breakdown of these expenses for both the BGSWD Corporation and the Bourbon-Harrison-Nicholas Corporation follows.

Capital Costs

As mentioned earlier, the initial landfill will serve the cities of Paris, Cynthiana, Carlisle, Millersburg and North Middletown plus the counties of Bourbon, Harrison and Nicholas. Based on the volume of solid waste generated within the area, capital requirements to commence operations would total about $59,100. An itemized list of capital requirements is presented in Table 14.

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*Costs are based on quotations as of November 30, 1970.

Table 14
Capital Cost Requirements
Bourbon-Harrison-Nicholas
Sanitary Landfill

Land*	$ 3,150
Equipment and attachments†	30,700
Site Development	
Engineering services‡	1,100
Geological survey‡	600
Legal fees	650
Access roads	4,000
Facilities§	6,000
Utilities	1,000
Fences	2,800
Scales	6,500
Office equipment‡	600
Landscaping	1,000
Miscellaneous	1,000
Total	$59,100

*7.5 acres @ $420 per acre; estimated life, five years.

†Initial cost of new equipment; useful life, three years with 50 percent capital recovery at end of three years.

‡Denotes capital expenses for BGSWD Corporation.

§Equipment shed–office (portable)

Source: Spindletop Research, Inc.

Table 15
Operating Expenses
Bourbon-Harrison-Nicholas
Sanitary Landfill

Equipment Maintenance and Repair	$ 4,500
Utilities	510
Labor	
Bulldozer Operator	7,280
Recorder/Bulldozer Operator	6,240
10% Fringe Benefits	1,352
Total	$19,882

Source: Spindletop Research, Inc.

Operating Expenses

Operating expenses that would be incurred for the first year of operation total $19,882. Table 15 presents a breakdown of the various operating expenses.

Administrative Expenses

Table 16 shows the administrative expenses for the first year of operation. The major expenses of $63,600 supports the administrative operation of the BGSWD Corporation which plans and promotes the expansion of the remaining six sanitary landfills as well as manages the operation of the initial sanitary landfill. To expect users of the sanitary landfill to support the entire cost for the first year would be unrealistic. In fact, the population should be expected to support no more than its estimated per capita cost for the District. This cost would be $0.14 per capita, or $5,480 for a population of 39,142.

The difference between $63,600 and $5,480 is $58,120 which should come from another source. And the only realistic source is through grant financing from federal and state sources until the entire system becomes operational, at which time each sanitary landfill would pay its share of the administrative cost.

Information available from the Office of Solid Waste Management Programs of the Environmental Protection Agency (EPA) indicates a grant might be obtained from EPA to cover $42,400 of the $63,600 needed for administrative costs during the first year. After subtracting the Bourbon-Harrison-Nicholas Corporation's share of administrative expense ($5,480) from the balance of administrative expenses remaining after such a grant ($21,200), a total of $15,820 remains as a corporate expense in excess of the Bourbon-Harrison-Nicholas Corporation's share.

To make up the $15,820, based on a charge of $0.14 per capita, there must be an additional 113,000 persons using one or more additional sanitary landfills during the first year. If the additional sites were added during the last six months, then the total population requirements for the first year would double.

Table 16
Administrative Expenses
Bluegrass Solid Waste
Disposal Corporation

Director	$18,000
Secretary/bookkeeper	6,000
10% fringe benefits	2,400
Communications	1,200
Rent (office)	1,800
Travel	1,500
Office supplies	600
Reports	1,800
Consultant*	30,000
Total	$63,600

* To design a rural collection system and provide technical assistance for operation and expansion of the corporation. Phased out after first year.

Source: Spindletop Research, Inc.

Projected administrative expenses for the second and third year of operations are shown in Tables 17 and 18, respectively. The projections are based on the development of additional sanitary landfills. As shown in Table 17, the administrative expenses for the second year total $60,604, or $2,996 less than those of the first year. This decline stems from a reduction in consultant fees, even though two additional employees were added to the Corporation's staff.

The administrative expenses for the third year of operation, as shown in Table 18, total $65,018. This increase of $4,414 can be attributed to salary increases, travel expenses and additional office supplies.

Comparisons of projected per capita administrative costs are presented in Table 19. The comparison shows a sharp decrease from $1.62 to $0.18 between the first and second year of operation. Between the second and third year, the administrative cost per capita drops slightly, from $0.18 to $0.14.

Selected Method of Financing

Until areawide participation is obtained, full use of grants and subsidies should be obtained to support the administrative expenses of the BGSWD Corporation. At present, the most advantageous method of financing appears to be a combination of grant and debt from EPA, FmHA and private sources. Table 20 illustrates the amount which would be required from each source to begin operations.

Any investment by EPA will be used to help defer administrative cost of the BGSWD Corporation. FmHA's investment would be used to help defer a portion of the capital cost of the Bourbon-Harrison-Nicholas Solid Waste Disposal Corporation and to finance another segment of the capital cost. The difference between the total capital cost and funds invested by EPA and FmHA will be obtained from private sources.

Table 17
Bluegrass Solid Waste Disposal Corporation
Second Year Administrative Expenses

Personnel		
Executive Director	$19,080	
Engineer/Assistant Director	13,000	
Secretary/Bookkeeper	6,360	
Bookkeeper	5,400	
	$43,840	
10% Fringe benefits	4,384	
		$48,224
Communications	$1,800	
Travel	2,080	
Rent	2,400	
Office Supplies	800	
Office Equipment	400	
Reports	300	
Consultants (Accountant and Attorney)	3,600	
Miscellaneous	1,000	
		$12,380
Total		$60,604

Source: Spindletop Research, Inc.

Table 18
Bluegrass Solid Waste Disposal Corporation
Third Year Administrative Expenses

Personnel		
Executive Director	$20,225	
Engineer/Assistant Director	13,780	
Secretary/Bookkeeper	6,742	
Bookkeeper	5,724	
	$46,471	
10% fringe benefits	4,647	
		$51,118
Communications	$2,400	
Travel	2,600	
Rent	2,400	
Office Supplies	1,200	
Office Equipment	300	
Reports	400	
Consultants (Accountant and Attorney)	3,600	
Miscellaneous	1,000	
		$13,900
Total		$65,018

Source: Spindletop Research, Inc.

Table 19
Bluegrass Solid Waste Disposal Corporation
Projected Expansion

Year	Counties Participating	Population	Administrative Cost	Cost Per Capita
1	Harrison, Bourbon, Nicholas	39,142	$63,600	$ 1.62
2	add/ Fayette, Scott, Woodford, Jessamine, Franklin, Anderson, Clark	331,206	$60,604	0.18
3	add/ Mercer, Boyle, Garrard Lincoln, Madison, Estill, Powell	457,552	$65,018	0.14

Source: Spindletop Research, Inc.

Table 20
Combination Grant-Debt Financing--Environmental Protection Agency, Farmers Home Administration, Private Sources

EPA 2/3 grant of cost of engineering services, geological survey, and office equipment	$1,533	
FmHA 50 percent grant of rural portion (25/39)* of $56,800 capital cost	$ 18,205	
Total Capital Grant	$19,738	
Remaining capital to be financed ($59,100 - $19,738)	$39,362	
FmHA 50 percent loan of rural portion (25/39)* of $56,800 capital cost--$18,205 for 10 years at five percent--annual cost	$ 2,358	
Private source loan of $21,157 ($39,362-$18,205)--three years at nine percent--annual cost	$ 8,358	
EPA 2/3 grant of $63,600 administrative cost ($63,600 - $42,400) remaining annual cost	$ 21,200	
Equipment, utilities and labor	$ 19,882	
Total annual cost		$51,798

Total EPA investment	$43,933
Total FmHA investment	$36,410
Total private investment	$21,157

*Ratio of rural to total population for Bourbon, Harrison and Nicholas Counties.

Source: Spindletop Research, Inc.

VIII. PRINCIPAL FINDINGS AND RECOMMENDATIONS

PRINCIPAL FINDINGS

- In 1970, the amount of solid waste generated within the Bluegrass Area Development District was estimated at 400,358 tons. On a per capita basis, each person generated 4.79 pounds per day.

- Sixteen of the 17 counties in the District have no county-wide rural collection system. Of the 17 counties, only five have county-operated disposal sites.

- Collection is mandatory by ordinance in 17 of the 29 cities in the District.

- Approximately 25 percent of the solid waste generated in the District is disposed by operations which have been permitted by the state of Kentucky.

- By the year 2000, solid waste generation within the District may increase to one million tons.

- Seven sanitary landfills will be required to handle the solid waste generated within the Bluegrass Area Development District.

- Each sanitary landfill will require different methods of financing to meet different problems and to take advantage of local opportunities. Consequently, each sanitary landfill not only should be financed separately, but should become operational at a different time.

- The initial operation will be confined to a three-county area in the northeast section of the District. The sanitary landfill will serve the counties of Bourbon, Harrison and Nicholas and the cities of Paris, Carlisle, Cynthiana, North Middletown and Millersburg.

- Although financial benefits of inter-jurisdictional cooperation may be apparent, they do not always serve as sufficient motivation for a jurisdiction to enter into a joint effort.

- Some counties are reluctant to enter into any agreement which would make them responsible for solid waste disposal.

- Most officials were only interested in when they would benefit from a solid waste disposal corporation, not in the mechanics of forming the organization.

- The Bluegrass Solid Waste Disposal Corporation (BGSWD), a nonprofit organization, is designed to reflect the needs of the jurisdictions within the District by providing representation of the jurisdictions on the board of directors.

- In addition to the solid waste disposal system, the Corporation plans to operate a rural area and highway container program and urban collection systems.

- Maximum multi-jurisdictional cooperation is required to generate gross income sufficient to support the individual sanitary landfill operations and the administrative expenses of the BGSWD Corporation.

- The extent of participation by jurisdictions will determine if realistic rates can be charged.

- Until maximum participation is obtained, full use of grants and subsidies should be obtained to support the administrative expenses of the BGSWD Corporation.

- A regional solid waste management system is feasible for the Bluegrass Area Development District.

PRINCIPAL RECOMMENDATIONS

- The solid waste disposal system, consisting of seven sanitary landfills within the District, should be implemented in several stages.

- A collection system should be extended to rural areas through a rural area and highway container program.

- The operation and maintenance of the seven sanitary landfills should be conducted according to the procedures specified by Kentucky State Department of Health.

- Final design and location of each sanitary landfill should be performed by a registered professional engineer to meet Kentucky Solid Waste Disposal Laws and Regulations.

- Sanitary landfills should operate on a "pay-as-you-go" basis by minimizing the use of borrowed funds and maximizing the use of subsidies, grants and leasing. Remaining capital requirements should first be met from low interest government loans and then from commercial bank loans.

- The rates necessary to be charged to place the operation on a pay-as-you-go basis should be determined for various amounts of waste. If a sufficient volume can be attained to allow the charging of realistic rates, the sanitary landfill can use the recommended pay-as-you-go method. If a volume insufficient to use this method is experienced, then other ratios of more and longer term debt to grants to leasing should be applied to the expected volume to determine if a workable rate structure can be formulated.

- Efforts should be made as soon as possible by the Corporation to initiate the operation of other sanitary landfills.

Appendix A

Calculating a Solid Waste Centroid

SOLID WASTE CENTROID

The ideal location of a sanitary landfill is one that would minimize the haul distances of collection trucks and maximize the efficient operation of the site.

In determining the area that will minimize haul distances of collection trucks, the solid waste centroid should be calculated. An example of calculations required to determine the solid waste centroid for a rural county is given in Figure A-1 and Table A-1.

Population distribution for small census tracts are given for only major Kentucky cities. The Kentucky Department of Highways has maps that locate rural houses in each county. Using average figures for persons per house, the number of houses in each city may be estimated. Houses rather than population are used in this example because they can be related to refuse collectors' reports of houses serviced.

A four-square-mile grid is used to estimate the density of houses in each area. The center coordinates of the four-square-mile grid form the centroid for that area. The houses in each area are counted and the corresponding coordinates are recorded in Table A-1.

The formula for calculating the coordinates of the solid waste centroid of the county is:

$$\overline{X} = \frac{\Sigma(XH)}{\Sigma H} \qquad \overline{Y} = \frac{\Sigma(YH)}{\Sigma H}$$

H = Number of houses within four-square-mile grid
X = X coordinate of center of four-square-mile grid
Y = Y coordinate of center of four-square-mile grid
$\overline{X}$ = Solid waste centroid coordinate
$\overline{Y}$ = Solid waste centroid coordinate

Table A-1
Calculations for a Solid Waste Centroid

No.	H	X	Y	XH	YH
1	2	6.7	2.7	13.4	5.4
2	23	8.0	2.3	184.0	53.0
3	13	9.8	2.6	127.2	33.8
4	8	12.0	2.7	96.0	21.6
5	1	13.0	2.4	13.0	2.4
6	3	4.7	4.7	14.1	14.1
7	22	6.0	4.0	132.0	88.0
8	24	8.0	4.0	192.0	96.0
9	25	10.0	4.0	250.0	100.0
10	33	12.0	4.0	396.0	132.0
11	9	13.3	4.0	119.7	36.0
12	12	2.8	6.3	33.6	75.5
13	19	4.0	6.0	76.0	114.0
14	28	6.0	6.0	168.0	168.0
15	36	8.0	6.0	288.0	216.0
16	74	10.0	6.0	740.0	444.0
17	32	12.0	6.0	384.0	192.0
18	24	13.5	6.0	324.0	144.0
19	6	2.5	7.5	15.0	45.0
20	23	4.0	8.0	92.0	184.0
21	25	6.0	8.0	150.0	200.0
22	25	8.0	8.0	200.0	200.0
23	24	10.0	8.0	240.0	192.0
24	29	12.0	8.0	348.0	232.0
25	27	14.0	8.0	378.0	216.0
26	2	2.8	9.2	5.6	18.4
27	9	4.5	9.5	40.5	85.5
28	29	6.0	10.0	174.0	290.0
29	24	8.0	10.0	192.0	240.0
30	32	10.0	10.0	320.0	320.0
31	27	12.0	10.0	324.0	270.0
32	25	13.8	9.8	345.0	245.0
33	6	15.3	9.3	91.8	55.8
34	12	8.0	11.3	96.0	135.8
35	28	10.0	11.8	280.0	331.0
36	27	12.0	12.0	324.0	324.0
37	3	13.3	11.2	39.9	33.6
38	1	12.3	13.2	12.3	13.2

$\Sigma H = 772$ $\Sigma XH = 7219.1$ $\Sigma YH = 5567.1$

$\overline{X}$ 9.3 $\overline{Y}$ 7.2

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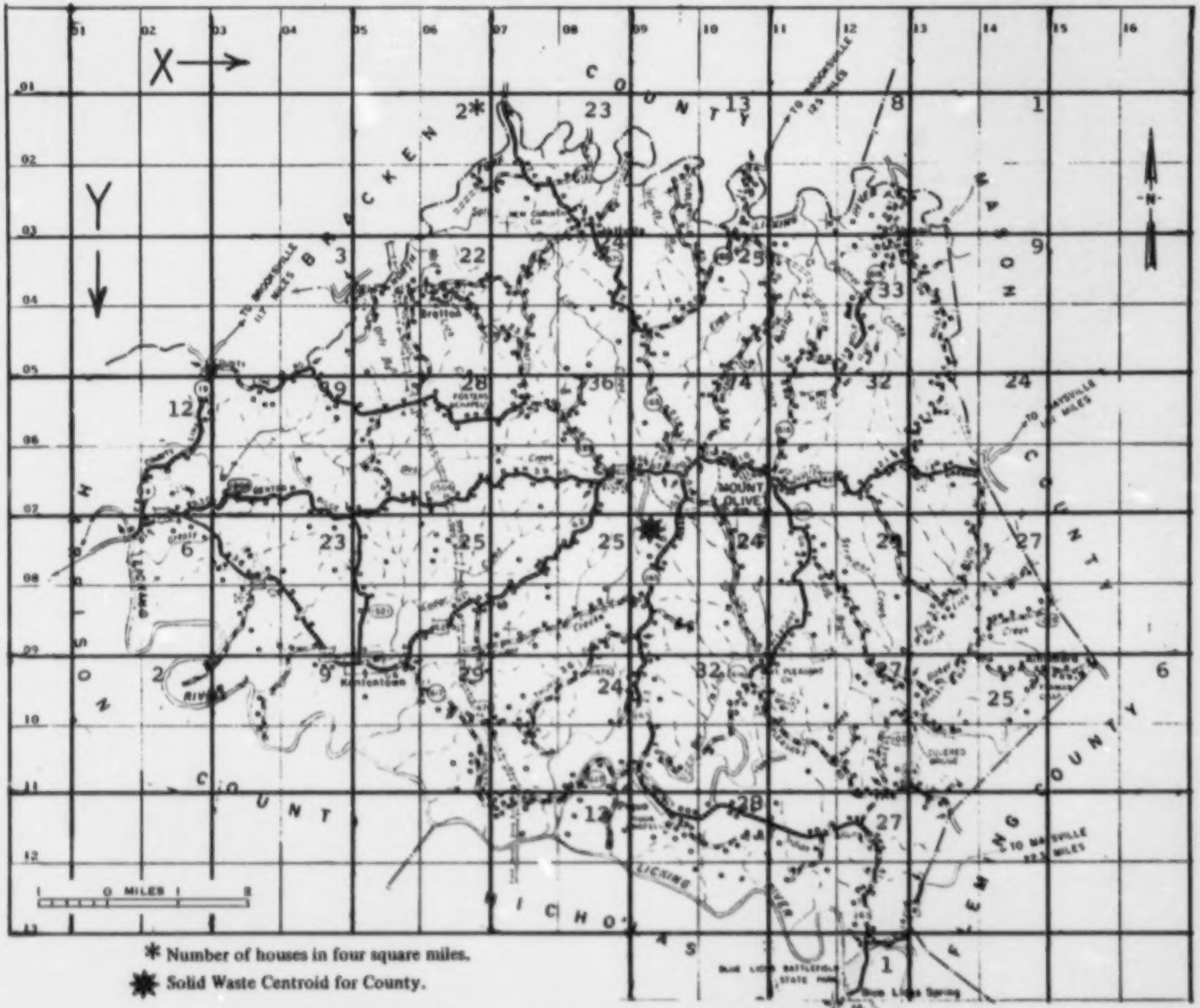

X →
Y ↓
N
01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16
01 02 03 04 05 06 07 08 09 10 11 12 13
BRACKEN COUNTY
MASON COUNTY
FLEMING COUNTY
NICHOLAS
HARRISON COUNTY
MOUNT OLIVE
Kentontown
Licking River
TO BROOKSVILLE
TO MAYSVILLE
Blue Licks Battlefield State Park
Blue Licks Spring
0 MILES 2
2* 23 13 8 1
3 22 24 25 33 9
12 19 28 36 24 32 24
6 23 25 25 24 29 27
2 9 29 24 32 27 25 6
12 28 27
1

* Number of houses in four square miles.

✸ Solid Waste Centroid for County.

Figure A-1. Example of Solid Waste Centroid Grid Map

Appendix B

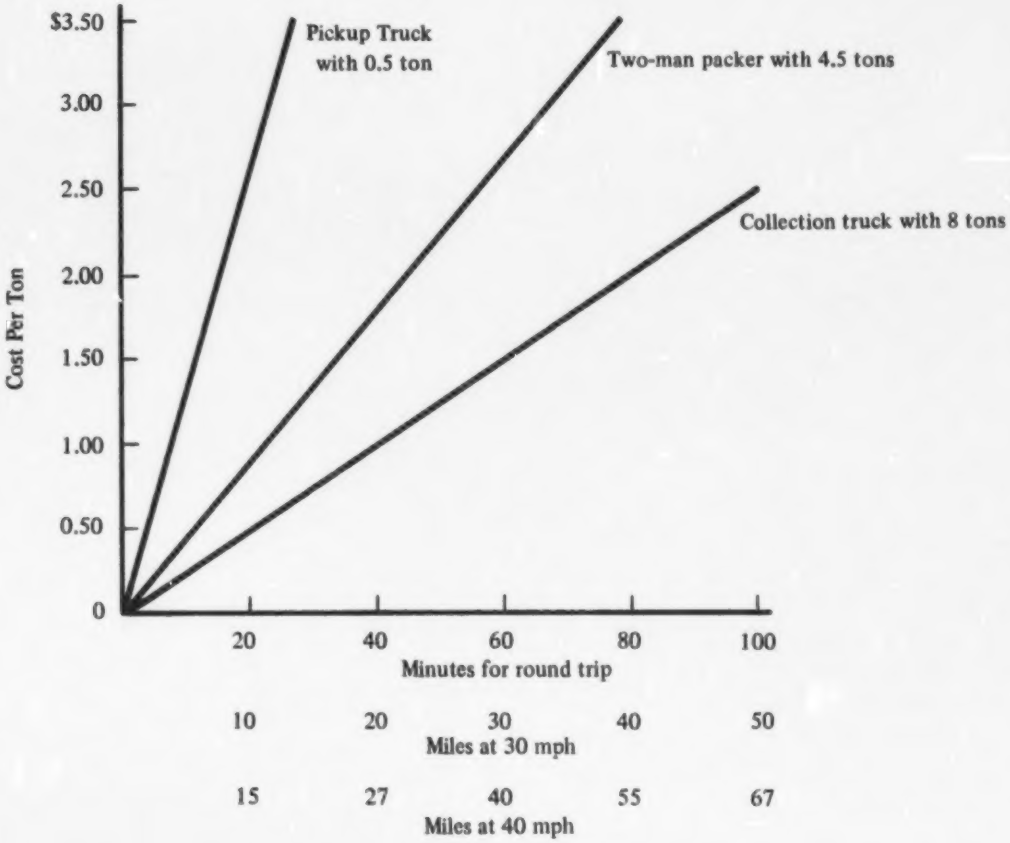
Haul Costs

HAUL COSTS

Haul costs are among the most important considerations in designing a regional disposal system. If the collection vehicles have to travel more than from 10 to 20 miles, the haul costs and disposal costs may exceed an individual city's budget for solid waste disposal. Another variable, especially for smaller communities, is the possibility of using a transfer station to reduce haul cost.

In determining haul costs, it is important to calculate the cost of collection or transfer vehicles and manpower. The annual cost can be broken down to a cost per hour, and the haul distances and corresponding haul times may be used to calculate haul costs.

Figure B-1 shows haul costs on a round trip basis for various collection vehicles and time periods. The two-man packer with a 4.5 ton load is the most common collection vehicle. Figure B-2 shows transfer station costs for various populations.



Source: *Sanitation Industry Yearbook*, 1968.

Figure B-1. Refuse Haul Cost Cost Comparison (Includes Labor and Equipment)

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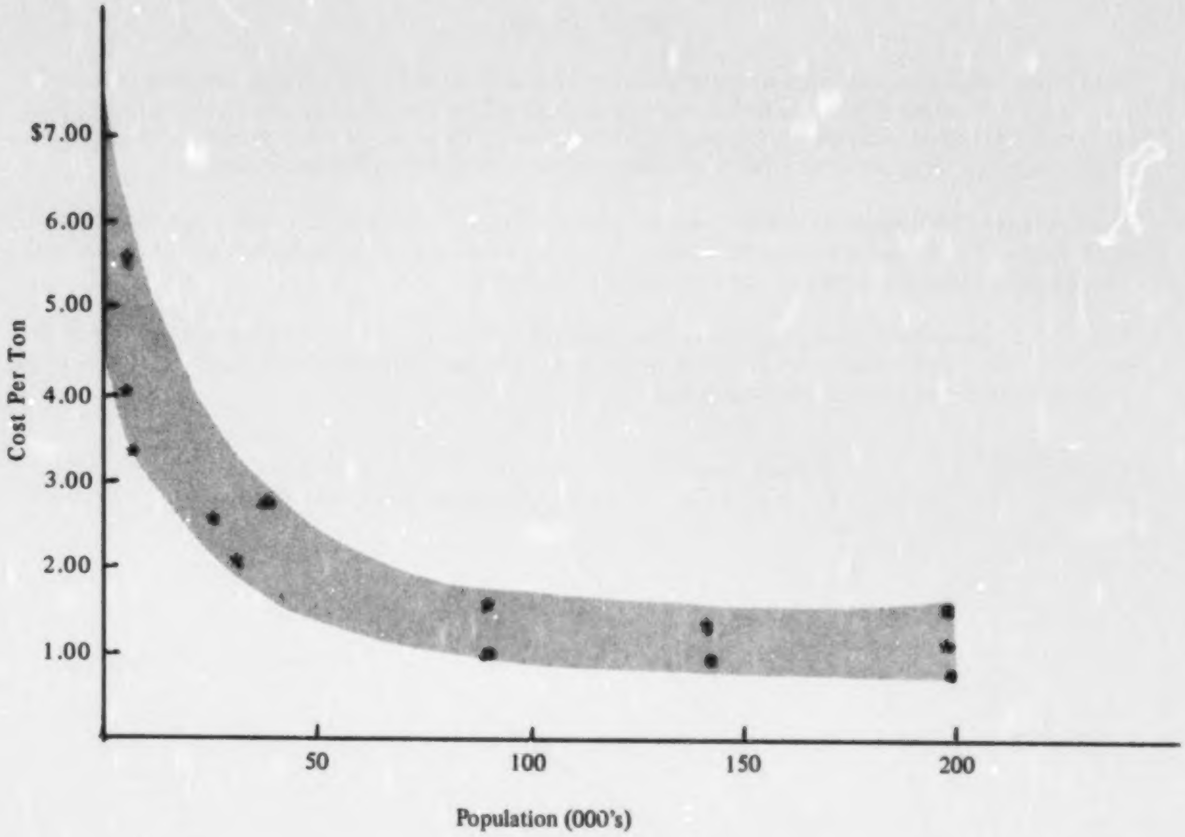

Source:

- ★ Spindletop Research, Inc.
- ● Heil Company
- △ Los Angeles County
- ■ Orange County, Calif.

Figure B-2. Transfer Station Cost

Appendix C

Sanitary Landfill Economics

SANITARY LANDFILL ECONOMICS

The purchase of equipment is usually a major initial investment in a sanitary landfill. Capital cost for new equipment usually begins at $20,000. The operation and maintenance of equipment are also major expenses in operating the sanitary landfill. Labor will usually amount to about 50 percent of the annual costs.

Land cost will depend on the area and acreage to be purchased. Only one acre per year may be needed for a population of 10,000, but land may have to be purchased in 20 to 30 acre lots. If land or equipment cannot be financed, they can be leased to minimize capital cost. But in most cases it is more economical to finance the land and equipment over a number of years and obtain salvage or use of the land and equipment after the life of each. Usually the investment in land can be recovered through development and sale or use of the land after it is filled.

For the purposes of this study, it was necessary to cost sanitary landfills for populations from less than 1,000 to 468,000. There is adequate economic data for sanitary landfills for populations of 100,000 or more, but little data for populations less than 50,000. Therefore, it was necessary to develop cost data for sanitary landfills servicing populations of 1,000 to 50,000. This data was used for comparing individual operations to a regional operation to determine, for example, whether it was more economical for a city of 5,000 to buy its own sanitary landfill and equipment or to share with another city of 10,000 and operate a joint sanitary landfill.

Even though some economic data were available, the methods of financing land and equipment varied. To compare economics, it is essential that all costs be prorated on an annual project basis. For example, a miscellaneous capital cost of $1,000 for a sanitary landfill with a life of five years was amortized over the five-year project life. By observing other techno-economic studies, a comparison of sanitary landfill cost on a dollars-per-ton basis is not valid unless comparable economic analyses are made. For example, dollars per ton based on capital costs in one study is not comparable to this study which is based on an annual cost.

The annual cost is used to compare nonuniform series of money disbursements where money has a time value. The annual cost is calculated by reducing the capital cost to an equivalent uniform annual series of payments and adding the fixed annual operating costs.

If the life, salvage value, and financing interest or expected rate of return are known, then the annual cost can be calculated. Table C-1 shows the capital recovery factors based on the life or use and interest rate. An example of the calculated annual cost of equipment is given in the table.

As mentioned earlier, equipment is a major portion of the capital cost, and equipment costing should be performed by obtaining a quote from reputable dealers. The sanitary landfill expert of an equipment manufacturer may be consulted and he may be asked to recommend equipment and quote the cost of equipment and accessories.

Table C-2 illustrates the cost of various crawler-loaders. The average salvage value of 50 percent after three years was obtained from "Used Equipment Auction Prices" shown in Figure C-1. Table C-2 also lists the annual maintenance and operation costs of the equipment. These costs were obtained from equipment manufacturers as part of a total quote shown in Figure C-2.

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Table C-1
Capital Recovery Factor (CRF)

	INTEREST				
Year	4 Percent	5 Percent	6 Percent	7 Percent	8 Percent
1	1.040	1.050	1.060	1.070	1.080
2	0.530	0.538	0.545	0.553	0.561
3	0.360	0.367	0.374	0.381	0.388
4	0.275	0.282	0.289	0.295	0.302
5	0.225	0.231	0.237	0.244	0.250
6	0.191	0.197	0.203	0.210	0.216
7	0.167	0.173	0.179	0.186	0.192
8	0.149	0.155	0.161	0.167	0.174
9	0.134	0.141	0.147	0.153	0.160
10	0.123	0.129	0.136	0.142	0.149

Example

Heavy equipment has a 50 percent salvage after 3 years.

The capital cost of equipment is $30,000 and can be financed at 6 percent. What is the annual cost of the equipment?

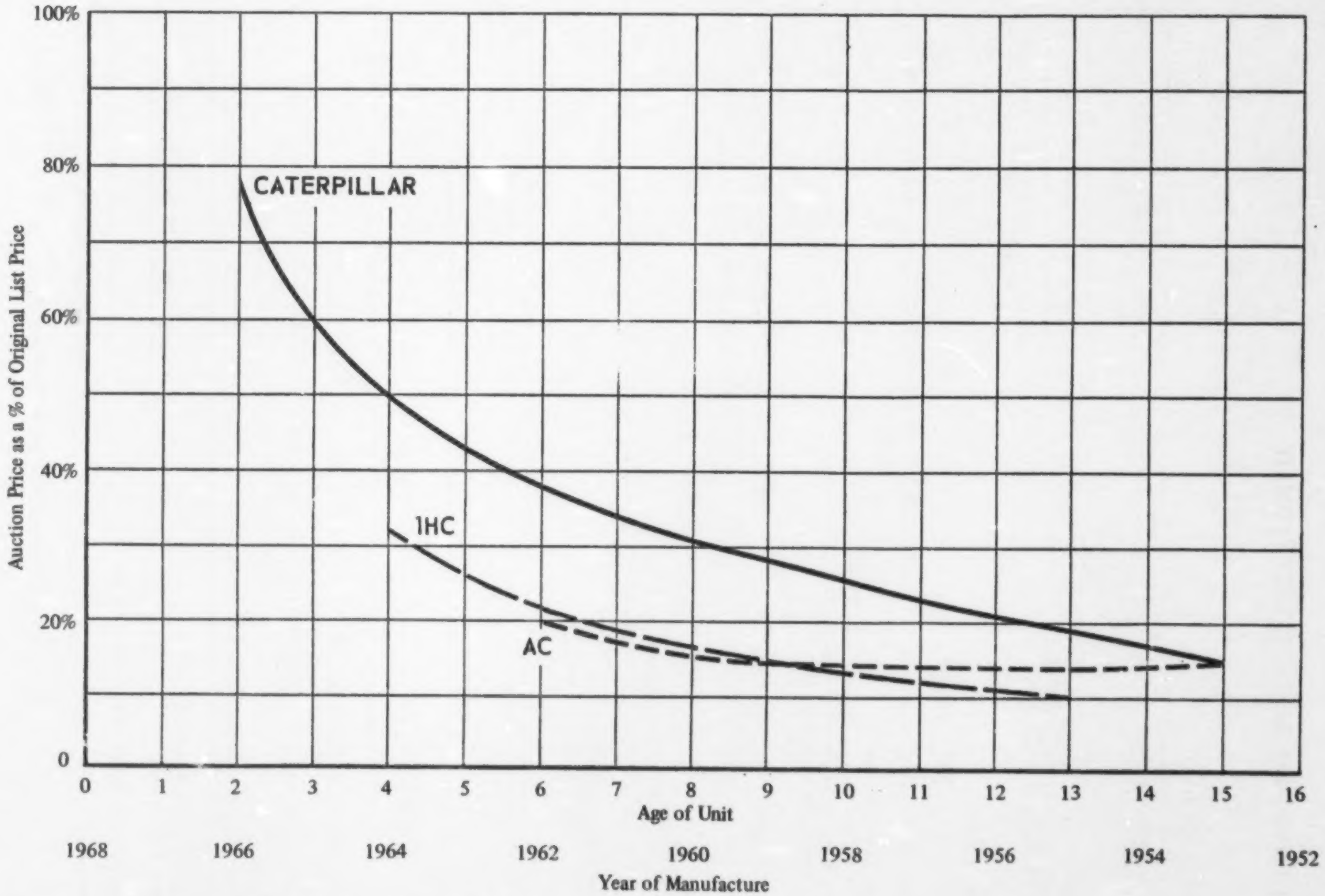
Annual Cost= (Capital Cost - Salvage) CRF + Salvage X Interest.
Annual Cost= ($30,000 - 50 percent X $30,000) 0.374 + $15,000 X 0.06.
Annual Cost= $5,610 + $900 = $6,510.

Table C-2
Crawler Loader Equipment Cost

Flywheel Horsepower	Capital Cost*	Trade-In† 3 yrs	Annual Cost	Maintenance and Operation
275	78,000	39,000	17,600	12,600
170	49,400	24,700	11,100	8,300
115	32,700	16,400	7,400	5,400
85	27,200	13,600	6,200	4,500
75	23,400	11,700	5,300	3,600

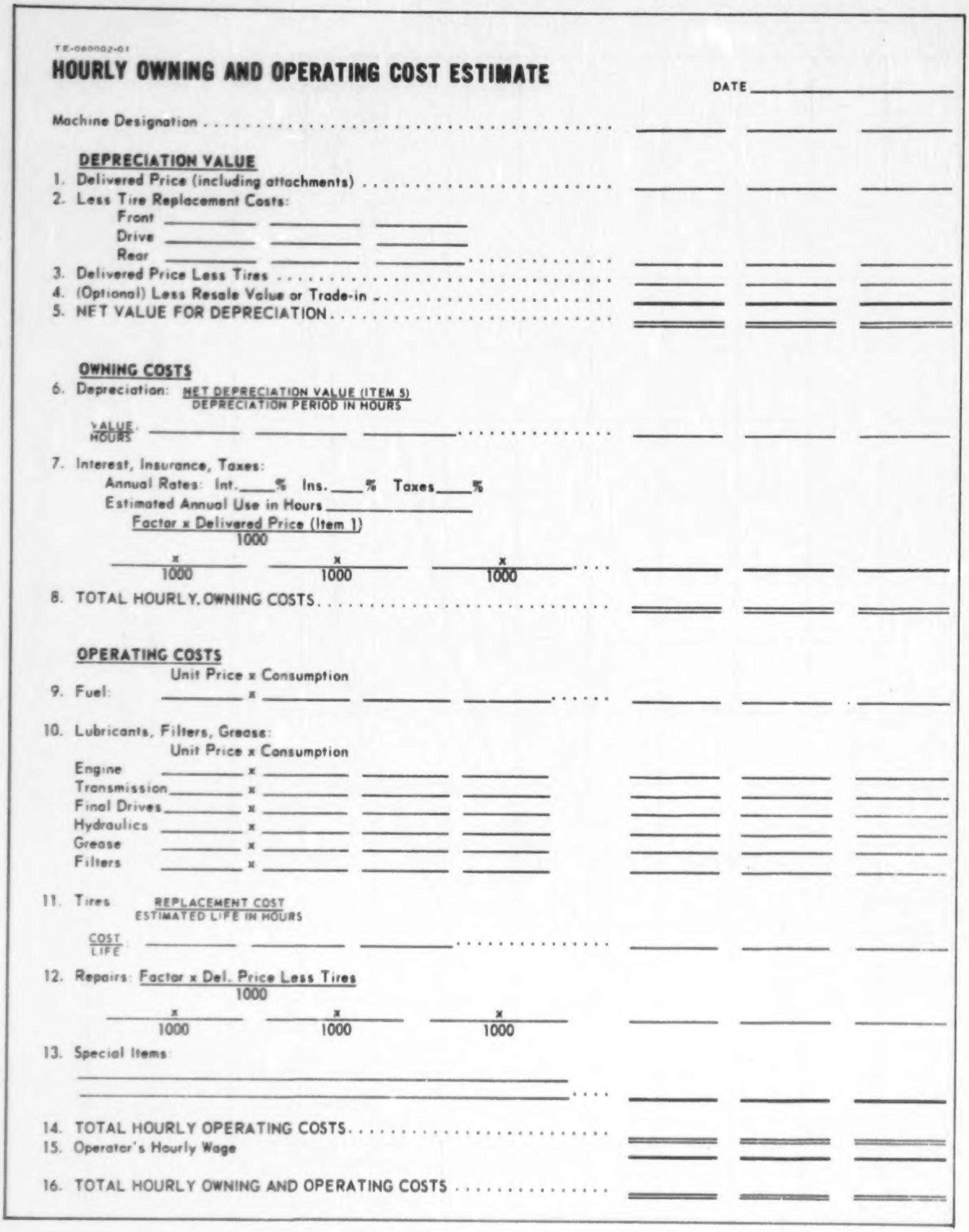
*Includes all necessary attachments.
†Used equipment auction prices.

Source: Spindletop Research, Inc.



Source: Used Equipment Auction Prices, Forke Brothers, 1969.

Figure C-1. Used Equipment Auction Prices



TE-080002-01

HOURLY OWNING AND OPERATING COST ESTIMATE

DATE ____________

Machine Designation . . . . ____ ____ ____

DEPRECIATION VALUE

1. Delivered Price (including attachments) . . . . ____ ____ ____
2. Less Tire Replacement Costs:
   Front ____ ____ ____
   Drive ____ ____ ____
   Rear ____ ____ ____ . . . . ____ ____ ____
3. Delivered Price Less Tires . . . . ____ ____ ____
4. (Optional) Less Resale Value or Trade-in . . . . ____ ____ ____
5. NET VALUE FOR DEPRECIATION . . . . ____ ____ ____

OWNING COSTS

6. Depreciation: $\frac{\text{NET DEPRECIATION VALUE (ITEM 5)}}{\text{DEPRECIATION PERIOD IN HOURS}}$

   $\frac{\text{VALUE}}{\text{HOURS}}$ ____ ____ ____ . . . . ____ ____ ____

7. Interest, Insurance, Taxes:
   Annual Rates: Int.____% Ins.____% Taxes____%
   Estimated Annual Use in Hours ____________
   $\frac{\text{Factor x Delivered Price (Item 1)}}{1000}$

   $\frac{\quad x \quad}{1000}$ $\frac{\quad x \quad}{1000}$ $\frac{\quad x \quad}{1000}$ . . . . ____ ____ ____

8. TOTAL HOURLY OWNING COSTS . . . . ____ ____ ____

OPERATING COSTS

Unit Price x Consumption

9. Fuel: ____ x ____ ____ ____ . . . . . . ____ ____ ____

10. Lubricants, Filters, Grease:
    Unit Price x Consumption
    Engine ____ x ____ ____ ____ ____ ____ ____
    Transmission ____ x ____ ____ ____ ____ ____ ____
    Final Drives ____ x ____ ____ ____ ____ ____ ____
    Hydraulics ____ x ____ ____ ____ ____ ____ ____
    Grease ____ x ____ ____ ____ ____ ____ ____
    Filters ____ x ____ ____ ____ ____ ____ ____

11. Tires $\frac{\text{REPLACEMENT COST}}{\text{ESTIMATED LIFE IN HOURS}}$

    $\frac{\text{COST}}{\text{LIFE}}$ ____ ____ ____ . . . . ____ ____ ____

12. Repairs: $\frac{\text{Factor x Del. Price Less Tires}}{1000}$

    $\frac{\quad x \quad}{1000}$ $\frac{\quad x \quad}{1000}$ $\frac{\quad x \quad}{1000}$ ____ ____ ____

13. Special Items:
    ____
    ____________________________ . . . . ____ ____ ____

14. TOTAL HOURLY OPERATING COSTS . . . . ____ ____ ____
15. Operator's Hourly Wage ____ ____ ____
16. TOTAL HOURLY OWNING AND OPERATING COSTS . . . . ____ ____ ____

Figure C-2. Hourly Owning And Operating Cost Estimate

In obtaining labor costs, the Kentucky Wage and Earnings Division was contacted. Their labor estimates were based on labor costs for bulldozer operators working for contractors on state construction projects. Private and municipal authorities were contacted to obtain their hourly pay scales for sanitary landfill operators. Labor costs vary in the Bluegrass Area Development District as indicated by a range of $2 to $5 per hour for bulldozer operators. Private operators state that from $3 to $4.50 an hour (depending on the county) is a realistic pay scale for a good bulldozer operator.

Cost estimates for engineering services, geological surveys, structures, scales, fences, and other items are based on actual quotes from businesses in the Bluegrass area.

In summary, it is important to obtain accurate equipment and labor cost estimates. However, for small sanitary landfills, other items such as scales, roads and fences must be carefully estimated as well.

Appendix D

Articles of Incorporation
Bluegrass Solid Waste Disposal Corporation

ARTICLES OF IMCORPORATION
OF
BLUEGRASS SOLID WASTE DISPOSAL CORPORATIONs,

KNOW ALL MEN BY THESE PRESENTS:

That I, Alan McElhaney, a resident and citizen of the Commonwealth of Kentucky, do form a corporation under and in pursuance of the Kentucky Nonprofit Corporation Act, with all the rights, privileges and immunities of a corporation organized for educational, charitable, and public purposes for the promotion of social welfare from which no private pecuniary profit is derived, and do adopt the following Articles of Incorporation.

Article I Name

The name of the Corporation shall be: Bluegrass Solid Waste Disposal Corporation by which name it may contract and be contracted with; sue and be sued; and carry on business consistent with its purposes and powers.

Article II Duration

The duration of the Corporation shall be perpetual unless dissolved as provided by law.

Article III Purposes

The purposes of the Corporation are to improve the health, welfare, and appearance of the Central Kentucky Region by effecting sanitary disposal of solid wastes through multijurisdictional cooperation and coordination; to cooperate with state, federal, and private agencies toward this end; to foster the education and training of the inhabitants of the Central Kentucky Region in the proper handling and disposition of solid waste; to eliminate unsanitary or unsightly solid waste dumps and other disposal facilities; and to provide for the improvement and beautification of lands devoted to solid waste disposal.

Article IV Registered Office

The registered office and principal place of business of said Corporation shall be: Spindletop Research Center, Iron Works Road, Lexington, Kentucky, 40505. The name and address of the person upon whom processes may be served is: Robert K. Wood, Spindletop Research Center, Iron Works Road, Lexington, Kentucky 40505.

Article V Board of Directors

The affairs and business of the Corporation shall be conducted by a Board of Directors whose membership shall be fixed by the bylaws. The initial Board of Directors will be five (5) in number, and are:

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Name	Address
Warren Powers	507 West College Street, Georgetown, Kentucky
Alfred Quartin	2802 Volomite Ct., Lexington, Kentucky
Stanley Rose	712 Beechmont Road, Lexington, Kentucky
William Schmidt	County Courthouse, Main St., Danville, Kentucky
Robert Stephens	Deepwood Drive, Lexington, Kentucky

The initial board of directors shall hold office for such period as is specified in the bylaws, and the successor board shall be elected and appointed in the manner and for the terms provided in the bylaws.

The Board of Directors shall have power:

a) To adopt bylaws and to alter, amend or repeal the same and to provide therein for the internal control and management of the Corporation in respect to time and place of meetings, title, number, and terms of officers and employees of the Corporation; and in respect to all other matters pertaining to the management and operation of the Corporation.

b) To establish policies for promoting the purposes of the Corporation and to make provisions for carrying on and conducting the disposition of solid waste and the other activities by the personnel of the Corporation or through contracts with other organizations.

c) To appoint an Executive Committee and such other committees as it may deem desirable to carry out the objectives of the Corporation.

Article VI Powers

In furtherance of the purposes and objects of the Corporation as set forth in Article III, the powers of the Corporation are:

a) To own and operate, directly or by contract with other public or private entities, a public solid waste collection and disposal business, including, but not limited to, sanitary landfills, transfer stations and hauling facilities, rural area and highway containers, and urban collection facilities.

b) To hire, engage, contract with or otherwise arrange with other persons, partnerships, or corporations to perform the operations of and operations related to solid waste disposal, sanitary landfills, transfer stations and hauling facilities, rural area and highway containers and urban collection facilities.

c) To engage in other businesses or activities which will enhance, improve or facilitate the solid waste disposal programs mentioned herein or which may be related to these operations.

d) To acquire by purchase, lease, option or otherwise, lands and improvements thereon; to erect buildings and construct roads on land owned by it and others; to sell, mortgage or to otherwise dispose of such lands, improvements and roads; to take by devise, bequest, gift, or grant-in-aid from all parties public and private, real and personal property, absolutely or as an agent or trustee; to hold, develop, improve, manage, and administer such properties; to acquire rent, lease or hire and to dispose of, by any lawful means, any and all personal property essential to or related to these ends.

e) To enter into contracts and to employ such persons as may be necessary to further and carry out these ends; to sue and be sued; to have a corporate seal.

f) To borrow money and to give its notes or other obligations therefor and to secure payment thereof by pledging or mortgaging any property, real or personal, it may own.

g) Without limits, as herein stated or otherwise, to do and perform all acts and to have the general powers as set forth in KRS Chapter 273 necessary or convenient to effect any or all of the purposes for which the Corporation is organized.

h) The foregoing purposes and powers shall be construed both as objectives and powers and it is hereby expressly provided that the foregoing accumulation of specific powers shall not be held to limit or restrict in any manner the general powers of this Corporation; and they are in furtherance of and in addition to, and not in limitation of, the general powers conferred by the laws of the Commonwealth of Kentucky.

Article VII Exemption from Liability

The director, officers and employees of the Corporation shall not, as such, be liable on its obligations.

Article VIII Capital Stock

The Corporation shall have no capital stock. No dividend shall be paid and no part of the income or profit of the Corporation shall be distributed to its members, directors, or officers except as reasonable compensation for services rendered.

Article IX Dissolution

In the event of dissolution of the Corporation, all liabilities and obligations shall be paid, any assets accepted and held by the Corporation upon condition requiring return upon dissolution shall be so returned, and any assets remaining shall be distributed in accordance with a plan of distribution adopted by the Board of Directors pursuant to the Kentucky Nonprofit Corporation Act.

Article X Special Provisions

The Corporation shall publish an annual report summarizing its functions and activities and accounting for all funds received and expended. The annual report shall be available to the public and will include a detailed balance sheet and operating statement. No part of the corporate activities shall consist of carrying on propaganda or otherwise attempting to influence legislation, or participating or intervening in any political campaign on behalf of any candidate for public office.

Article XI Amendment

These articles may be amended at a meeting of the Board of Directors upon receiving the vote of a majority of the directors in office.

Article XII

The name and address of the incorporator is as follows:

Alan McElhaney	1346 Village Drive Lexington, Kentucky

IN TESTIMONY WHEREOF witness my hand this 6th day of July, 1970.

Alan McElhaney

STATE OF KENTUCKY)
)   SCT.
COUNTY OF FAYETTE)

I, a Notary Public in and for the State and County aforesaid, do hereby certify that the foregoing Articles of Bluegrass Solid Waste Disposal Corporation, a Kentucky corporation, were this day produced before me in said State and County and were thereupon acknowledged by Alan McElhaney to be his free and voluntary act and deed for uses and purposes set out therein, all of which together with this, my Certificate, is hereby certified to the Secretary of State of the Commonwealth of Kentucky and to the Clerk of the Fayette County Court, Lexington, Kentucky.

My Commission expires March 25, 1974.

WITNESS MY HAND and official seal of office this 6th day of July, 1970.

NOTARY PUBLIC

THIS INSTRUMENT PREPARED BY;

Robert K. Wood
Attorney at Law
Lexington, Kentucky

Appendix E

Bylaws of
Bluegrass Solid Waste Disposal Corporation

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BYLAWS
of
BLUEGRASS SOLID WASTE DISPOSAL CORPORATION

ARTICLE I. OFFICES

The principal office of the Corporation in the State of Kentucky shall be located in the County of Fayette. The Corporation may have such other offices within the State of Kentucky as the Board of Directors may determine.

ARTICLE II. MEMBERS

The Corporation shall have no members.

ARTICLE III. BOARD OF DIRECTORS

Section 1. **General Powers**. The affairs of the Corporation shall be managed by its Board of Directors.

Section 2. **Number, Members, and Tenure**. The initial Board of Directors shall hold office until successor directors have been designated and elected as set out in these Bylaws. The Board shall consist of ex officio members and elected members, the ex officio members shall number not less than three (3) and shall consist of:

One (1) designee of the legislative body of each city participating in the waste disposal operations of the Corporation or maintaining on file with the corporate secretary a current letter of intent to participate in said operations of the Corporation;

One (1) designee of the legislative body of each county participating in the waste disposal operations of the Corporation or maintaining on file with the corporate secretary a current letter of intent to participate in said operations of the Corporation;

One (1) designee of the Chairman of the Bluegrass Comprehensive Health Planning Council; and

One (1) designee of the Commissioner of the Kentucky Department of Health.

The elected members shall consist of:

Three (3) or more persons, the total number not to exceed the number of ex officio directors, elected at annual meetings by a simple majority vote of the ex officio directors, to include at least one person from each of the following groups:

a) solid waste contractors participating in the operations of the corporate disposal system;

b) citizens-at-large representing residential users of the system; and

c) citizens-at-large representing business and industrial users of the system.

The term of each director shall begin at the first annual meeting of the Board. Ex officio directors designated by cities or counties may take office at any time upon compliance with the

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requirements set out hereinbefore. The term of each director shall end at the next annual meeting. Directors for the following year shall be designated and elected as hereinbefore set out. Only those ex officio members designated prior to the time of each annual meeting shall be eligible to vote for the elected members. All letters of intent shall be renewed and filed within ten (10) days prior to each annual meeting. Any vacancies occurring in the elected board positions shall be filled by the vote of the ex officio members, and such replacement directors shall serve for the unexpired term of his predecessor in office. Any director may succeed himself and may be designated or elected for any number of terms.

Section 3. **Chairman of the Board**. A Chairman of the Board shall be elected by the Board, The Chairman of the Board shall preside at all meetings of the Board of Directors, and perform such other duties as may be provided for by these Bylaws or the Board of Directors. In the absence or disability of the Chairman, a temporary Chairman shall be selected by the members present and shall preside at meetings of the Board, and shall in addition perform such other duties as may be imposed upon him by these Bylaws or by the Board of Directors.

Section 4. **Annual Meeting**. The annual meeting of the Board of Directors shall be held the month of November of each year upon the notice set out in these bylaws.

Section 5. **Regular Meetings**. Regular meetings of the Board shall be held at least semiannually in November and May of each year. The Board of Directors may provide by resolution the time and place for the holding of additional regular meetings of the Board without other notice than such resolution.

Section 6. **Special Meetings**. A special meeting of the Board may be called by the Chairman of the Board upon the written request of a majority of the members.

Section 7. **Notice**. Notice of any meeting of the Board of Directors shall be given at least ten (10) days in advance thereof by written notice delivered personally or sent by mail or telegram to each Director at his address as shown by the records of the Corporation. If mailed, such notice shall be deemed to be delivered when deposited in the United States mail in a sealed envelope so addressed, with postage thereon prepaid. If notice be given by telegram, such notice shall be deemed to be delivered when the telegram is delivered to the telegraph company. Any Director may waive notice of any meeting. The attendance of a Director at any meeting shall constitute a waiver of notice of such meeting, except where a Director attends a meeting for the express purpose of objecting to the transaction of any business because the meeting is not lawfully called or convened.

Section 8. **Quorum**. A majority of the Board of Directors shall constitute a quorum for the transaction of business at any meeting of the Board.

Section 9. **Manner of Acting**. The act of a majority of the Directors present at a meeting at which a quorum is present shall be the act of the Board of Directors.

Section 10. **Informal Action by Directors**. Any action required by law to be taken at a meeting of Directors, or any action which may be taken at a meeting of Directors, may be taken without a meeting if a consent in writing, setting forth the action so taken, shall be signed by all of the Directors.

Section 11. **Remuneration of Directors**. Directors shall not receive pay for their services.

ARTICLE IV. OFFICERS

Section 1. **Officers**. The officers of the Corporation shall be a President, a Secretary, a Treasurer, and such Vice Presidents as the Board may deem desirable. Such officers shall have the authority to perform the duties prescribed from time to time by the Board of Directors. Any two of the offices of Vice President, Secretary, and Treasurer may be combined in one person. The Board of Directors may establish such other offices as in their judgement the Corporation shall require and shall make or authorize appointments to such offices.

Section 2. **Election and Term of Office**. The officers of the Corporation shall be elected at the annual meeting of the Board. If the election of officers shall not be held at such meeting, such election shall be held as soon thereafter as conveniently may be. New offices may be created and filled at any meeting of the Board of Directors.

The Board of Directors is authorized to enter into employment contracts with the President or other officers for such term and upon such conditions as the Board in its discretion shall deem advisable.

Section 3. **Removal**. Any officer elected by the Board of Directors may be removed by the Board of Directors whenever in its judgement the best interests of the Corporation would be served thereby, but such removal shall be without prejudice to the contract rights, if any, of the officer so removed.

Section 4. **Vacancies**. A vacancy in any office because of death, resignation, removal, disqualification, or otherwise, may be filled by the Board of Directors for the unexpired portion of the term.

Section 5. **President**. The President shall be the chief executive officer of the Corporation, and subject to the direction of the Board of Directors and the Executive Committee; shall generally supervise and direct the affairs of the Corporation; shall make such reports to the Board of Directors and to the Executive Committee as he may deem necessary, or shall be required by these Bylaws or by said Board of Executive Committee; shall have power to employ, remove, and suspend all agents and employees, to determine the duties and responsibilities of such agents and employees, to create such titles for such agents and employees as may be regarded as desirable to enable the agents and employees to execute their duties and responsibilities, and to fix and change the compensation of such agents and employees; shall sign and countersign all contracts and other instruments of the Corporation authorized by the Board of Directors or the Executive Committee; shall do all other things not expressly provided for and not prohibited by these Bylaws necessary or proper to accomplish any of the objectives or effectively exercise any powers specified in this Section; and shall perform such other duties and exercise such other powers as may be imposed upon him or authorized from time to time by the Board of Directors or by its Executive Committee.

Section 6. **Vice President**. The Vice President, in the absence or disability of the President shall perform the duties of the President and such other duties as may be assigned to him.

Section 7. **Secretary**. The Board of Directors shall elect a Secretary of the Corporation. The Secretary shall keep in books belonging to the Corporation the minutes of the meetings of the Board of Directors and the Executive Committee. The Secretary shall have custody of the seal and corporate minute books; shall sign with the President instruments requiring his signature; and shall make such reports and perform such duties as are incident to his office or are required by these Bylaws or which may be required of him by the Board of Directors.

Section 8. **Treasurer**. The Board of Directors shall elect a Treasurer of the Corporation who shall be responsible for verifying and certifying financial reports and records of the Corporation and such other duties and responsibilities as may be assigned to him by the Board. He shall make an annual public report on all funds received and expended by the Corporation.

ARTICLE V. COMMITTEES

Section 1. **Executive Committee**. By resolution adopted by a majority of the Directors in office, the Board may designate and appoint from its members an Executive Committee consisting of at least two directors including a Chairman of the Executive Committee. The Chairman shall preside at all meetings of the Executive Committee. In the absence or disability of the Chairman, a temporary Chairman shall be selected by the committee members present, and he shall act for the purpose of the meeting as Chairman of the Executive Committee. The Executive Committee shall have full authority to act for and on behalf of the Corporation and to take any and all action within the power of the Board of Directors except as limited by the Articles of Incorporation or KRS 273.221. The Executive Committee shall report to the Board of Directors any and all action taken by it at the next regular or special meeting of the Board. The Executive Committee shall meet at least every quarter on call of the Chairman of the Executive Committee.

Section 2. **Other Committees**. Other committees not having and exercising the authority of the Board of Directors in the management of the Corporation may be appointed in such manner as may be designated by a resolution adopted by a majority of the Directors present at a meeting at which a quorum is present. Members of other committees need not be members of the Board of Directors.

Section 3. **Term of Office**. Each member of a committee shall continue as such for the term provided in the resolution creating the committee and until his successor is appointed.

Section 4. **Committee Chairman**. One member of each committee shall be appointed chairman by the person or persons authorized to appoint the members thereof.

Section 5. **Vacancies**. Vacancies in the membership of any committee may be filled by appointments made in the same manner as provided in the case of the original appointments.

Section 6. **Quorum**. Unless otherwise provided in the resolution of the Board of Directors designating a committee, a majority of the whole committee shall constitute a quorum and the act of a majority of the members present at a meeting at which a quorum is present shall be the act of the committee.

Section 7. **Rules**. Each committee may adopt rules for its own government both inconsistent with these Bylaws or with rules adopted by the Board of Directors.

ARTICLE VI. BOOKS AND RECORDS

Section 1. The Corporation shall keep correct and complete books and records and shall also keep minutes of the proceedings of its Board of Directors and its Executive Committee. The books and records of the Corporation may be inspected by any Director for any proper purpose at any reasonable time.

ARTICLE VII. SEAL

The Board of Directors shall provide a corporate seal, which shall be in the form of a circle and shall have inscribed thereon the name of the Corporation and the words "Corporate Seal."

ARTICLE VIII. FISCAL YEAR

The fiscal year of the Corporation shall begin on the first day of July and end on the last day of June in each year.

ARTICLE IX. INDEMNIFICATION OF OFFICERS AND DIRECTORS

Section 1. Each Director and officer of the Corporation or his personal representative shall be indemnified by the Corporation against claims, liabilities, expenses, and costs actually and necessarily incurred by him or his estate in connection with, or arising out of, any action in which he is made a party by reason of his being or having been an officer or Director, except in relation to matters as to which he shall be adjudged in such action to be liable for actual negligence or misconduct in the performance of his duties as such Director or officer.

Section 2. The right of indemnification herein provided for shall also apply in respect of any amount paid in compromise of any such claim asserted against such officer or Director (including expenses and costs actually and necessarily incurred in connection therewith), provided the Board of Directors of the Corporation shall have first approved such proposed compromise settlement and determined that the Director or officer involved was not guilty of actual negligence or misconduct, but in taking such action any Director involved shall not be qualified to vote.

ARTICLE X. CONFLICT OF INTEREST

Any Director or member of his family having or intending to have a direct or indirect financial interest in any matter coming before the Board shall promptly disclose such interest to the Board and, shall not participate in any discussions or voting on any such matters, as directed by the Board of Directors.

ARTICLE XI. AMENDMENTS TO BYLAWS

These Bylaws may be altered, amended, or repealed, and new Bylaws may be adopted by the Board of Directors at any regular meeting or at any special meeting, if at least ten (10) days written notice is given of intention to alter, amend, repeal, or adopt new Bylaws.

Appendix F

Letter of Intent and Designation
Bluegrass Solid Waste Disposal Corporation

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October 29, 1970

LETTER OF INTENT

COUNTY OF__________________

WHEREAS, it is recognized that solid waste disposal is of direct concern to local public health and welfare and is an ever-increasing problem, and

WHEREAS, it is recognized that multijurisdictional cooperation in solid waste disposal can benefit all participants, and

WHEREAS, the Bluegrass Solid Waste Disposal Corporation has been established to plan and carry out solid waste disposal in the Bluegrass Region,

IT IS THEREFORE STATED that_____________County intends to participate in the solid waste disposal operations of said corporation and intends to designate a member of the board of directors of said corporation, and

IT IS FURTHER UNDERSTOOD that this letter of intent shall become effective upon ratification by a resolution of the Fiscal Court at a regularly scheduled meeting prior to the annual board meeting of the Corporation to be held in November, 1970.

NAME	TITLE
__________________	____________________________________
__________________	____________________________________
__________________	____________________________________
__________________	____________________________________
__________________	____________________________________
__________________	____________________________________

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DESIGNATION

By resolution of the legislative body of ____________________ (city/county), Kentucky, __________ is hereby designated as a member of the Board of the Bluegrass Solid Waste Disposal Corporation.

/S/ ______________________________
Title

Appendix G

Bluegrass Solid Waste Disposal Corporation–Corporate Structure

As pointed out in Section VI, the corporate structure of the Bluegrass Solid Waste Disposal Corporation is similar to that employed by private business companies. Figure G-1 shows the organizational structure of the corporation.

In addition to its board of directors, executive committee and president, the corporation comprises (1) a vice president in charge of solid waste disposal, (2) a vice president in charge of urban and rural collection plus maintenance and repair, (3) a secretary, (4) a treasurer, and (5) legal counsel. A detailed description of the organizational structure of the corporation follows.

BOARD OF DIRECTORS

The policies, programs, scope and nature of the operations of the Bluegrass Solid Waste Disposal Corporation are determined by the Board of Directors of the Corporation, and for, and in the name of, the board by its executive committee and such other committees as the board might establish. The chairman of the board is its principal officer and its liaison with the officers of the Corporation who execute the board's directives.

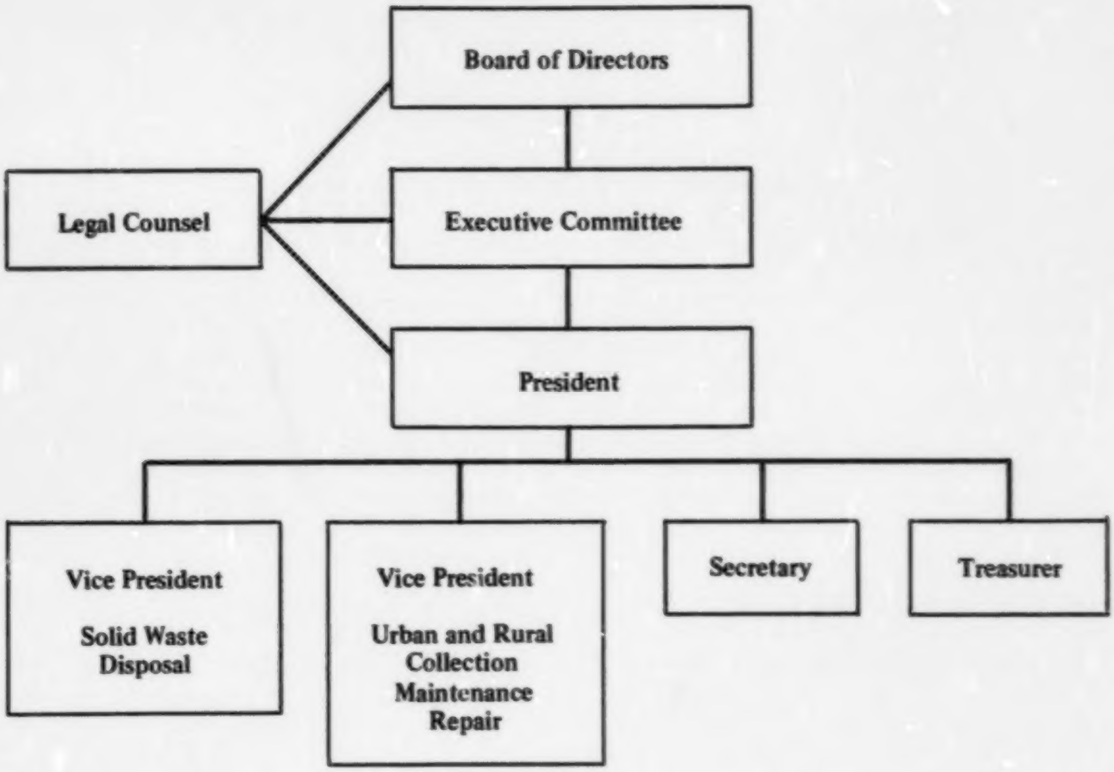
Board of Directors
Legal Counsel
Executive Committee
President
Vice President Solid Waste Disposal
Vice President Urban and Rural Collection Maintenance Repair
Secretary
Treasurer

Figure G-1. Corporate Organization–Bluegrass Solid Waste Disposal Corporation.

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Number, Members, and Tenure of Board

The board consists of at least three (3) ex officio members and three (3) elected members. The ex officio members shall consist of:

- One (1) designee of the legislative body of each city participating in the waste disposal operations of the Corporation or maintaining on file with the corporate secretary a current letter of intent to participate in said operations of the Corporation;

- One (1) designee of the legislative body of each county participating in the waste disposal operations of the Corporation or maintaining on file with the corporate secretary a current letter of intent to participate in said operations of the Corporation;

- One (1) designee of the Chairman of the Bluegrass Regional Health Planning Council; and

- One (1) designee of the Commissioner of the Kentucky Department of Health. The elected members consist of:

Three (3) or more persons, the total number not to exceed the number of ex officio directors, elected at annual meetings by a simple majority vote of the ex officio directors, to include at least one person from each of the following groups:

- Solid waste contractors participating in the operations of the corporate disposal system;

- Citizens-at-large representing residential users of the system; and

- Citizens-at-large representing business and industrial users of the system.

The term of each director shall begin at the first annual meeting of the board. Ex officio directors designated by cities or counties may take office at any time upon compliance with the requirements set out hereinbefore. The term of each director shall end at the second annual meeting. Directors for the following year shall be designated and elected as stated hereinbefore. Only those ex officio members designated before the time of each annual meeting shall be eligible to vote to elect members. All letters of intent shall be renewed and filed within ten (10) days prior to each annual meeting. Any vacancies which occur in the elected board positions shall be filled by the vote of the ex officio members, and replacement directors shall serve for the unexpired term of their predecessors in office. Any director may succeed himself and may be designated or elected for any number of terms.

OFFICERS AND OTHER EXECUTIVES

The officers of the Corporation consist of a president, two vice presidents, a secretary and a treasurer.

President

The president is the chief executive officer and has primary responsibility for the execution of the board's directives as well as all of the operations of the Corporation. The two vice presidents, the secretary and the treasurer of the Corporation report and are responsible to him. The president has the ultimate responsibility for all operations, but not the policies, of the Corporation. He reports directly to the chairman of the board.

Vice Presidents

As shown in Figure G-2, one of the two vice presidents will be in charge of two of the four programs of the Corporation: the solid waste disposal system and the office of the chief engineer. The other vice president will be in charge of the rural area and highway container programs and urban collection systems programs as well as maintenance and repair, as shown in Figure G-3. Each of these vice presidents has complete responsibility for the operation of his programs and reports directly, and is responsible, to the president.

Secretary

The secretary keeps all the records of the Corporation except the accounting and statistical records. He acts as secretary of the Board of Directors, executive and other committees of the board and keeps the minutes of their meetings and records of their proceedings. Since only a fraction of his time is taken by these activities, the secretary is assigned other functions such as responsibility for the personnel office, the public relations office and the research and investigation office. He reports and is directly responsible to the president. His duties are illustrated in Figure G-4.

Treasurer

The treasurer is the chief fiscal officer of the Corporation and is responsible for the financial operations of the Corporation, its accounting and statistical records and the office of the purchasing agent. Figure G-5 illustrates his responsibilities. He reports and is directly responsible to the president.

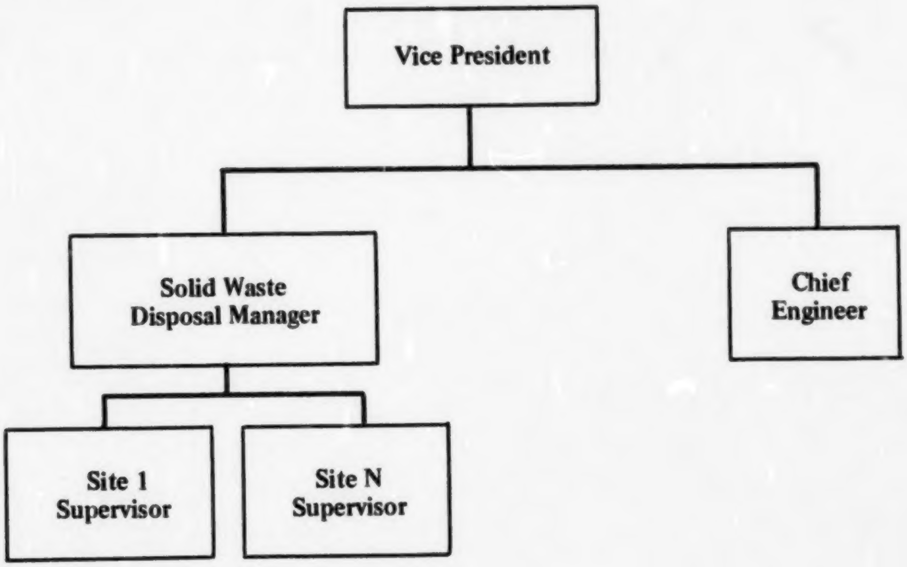

Figure G-2. Vice President in Charge of Solid Waste Disposal—
Bluegrass Solid Waste Disposal Corporation

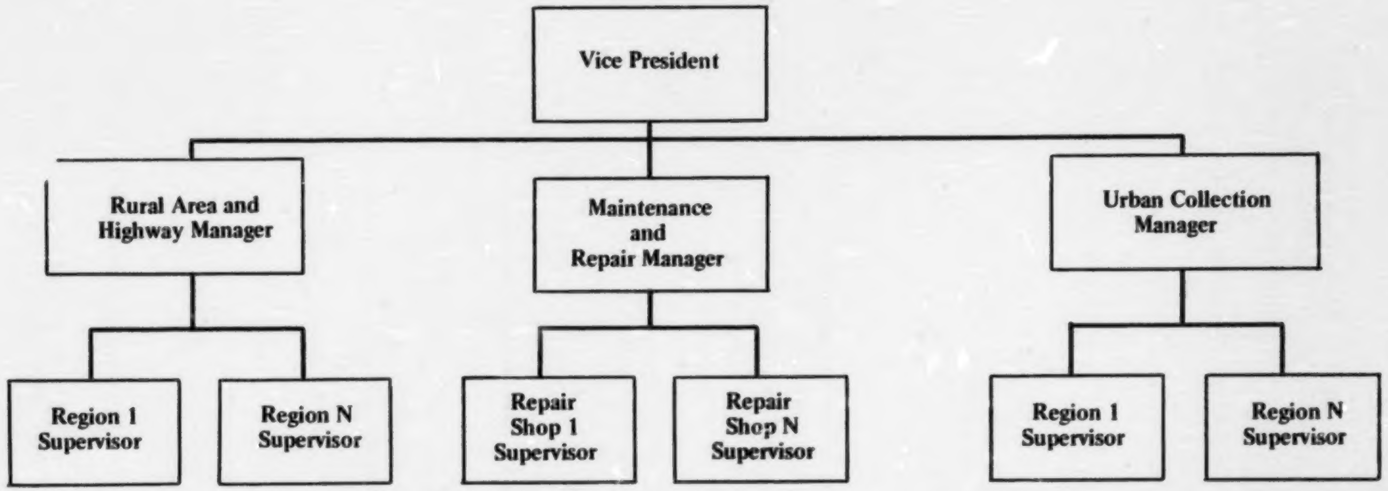
Vice President
Rural Area and Highway Manager
Maintenance and Repair Manager
Urban Collection Manager
Region 1 Supervisor
Region N Supervisor
Repair Shop 1 Supervisor
Repair Shop N Supervisor
Region 1 Supervisor
Region N Supervisor

Figure G-3. Vice President in Charge of Rural Area and Highway Collection and Urban Collection – Bluegrass Solid Waste Disposal Corporation.

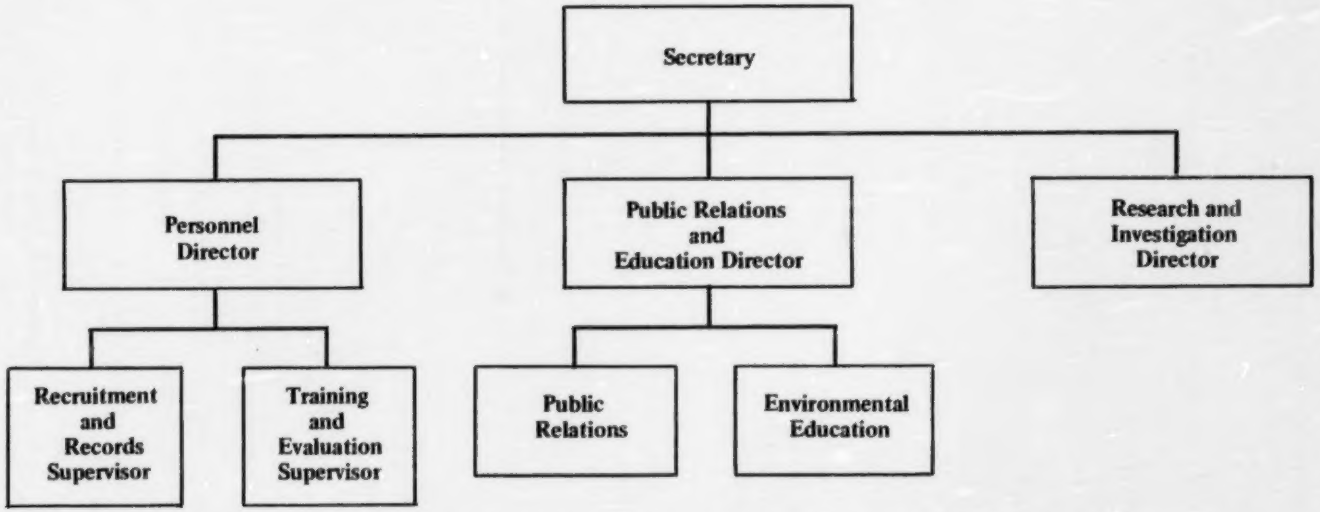
Secretary
Personnel Director
Public Relations and Education Director
Research and Investigation Director
Recruitment and Records Supervisor
Training and Evaluation Supervisor
Public Relations
Environmental Education

Figure G-4. Secretary – Bluegrass Solid Waste Disposal Corporation.

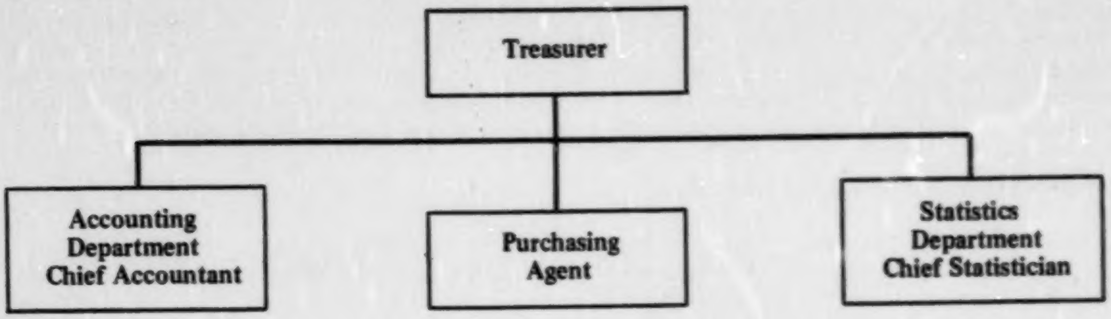
Treasurer
Accounting Department Chief Accountant
Purchasing Agent
Statistics Department Chief Statistician

Figure G-5. Treasurer–Bluegrass Solid Waste Disposal Corporation

Other Executives

In addition to the corporate officers, the Corporation will employ executives of various ranks and responsibilities.

Office of the Chief Engineer

The vice president in charge of solid waste disposal is also responsible for the work of the chief engineer. Solid waste disposal by the sanitary landfill method involves civil and sanitary engineering problems as well as landscaping and planning for future use of filled sites. If the Corporation is to fulfill its assigned role, these problems must receive its attention.

The solution of these problems and the acceptance of these responsibilities is placed with the office of the chief engineer of the Corporation. The chief engineer should be a specialist in at least one of the fields of his responsibilities; he may engage other assistants and personnel so that his office can carry out all of its responsibilities.

Maintenance and Repair

The other vice president is responsible for the maintenance and repair work assigned to a maintenance and repair manager. This manager supervises a series of maintenance and repair shops, one for each type, or a group of related types, of equipment (including roads, buildings and office equipment), with each shop under the direction of a foreman.

Office of the Secretary

The secretary of the Corporation, in addition to his corporate functions sketched in an earlier section of this report, is assigned responsibility for the Office of Personnel and the Office of Public Relations, as well as those of Education, Research and Investigation.

Office of Personnel

This office performs the usual functions associated with personnel management. It keeps the personnel records; cooperates with the other offices of the Corporation in hiring, transferring, terminating and retiring employees; administers fringe benefits offered by the Corporation, such as workmen's compensation, insurance programs and retirement programs; provides counseling service; develops personnel policies such as those related to the promotion and transfer of employees, salary and wage rates, disciplinary actions, incentive programs, programs designed to maintain and improve working conditions and employee morale; develops employee training programs; prepares grievance procedures; adjudicates grievances and handles other related personnel programs and policies.

Office of Public Relations and Education

This office, under the supervision of a director, performs three important and related functions: those of public relations, those of educating the inhabitants of the Bluegrass Area Development District in proper sanitary solid waste disposal methods and techniques as well as those of offering training in solid waste disposal techniques to all those engaged in this work in the District.

The public relations work consists of the relations of the Corporation with the press, radio and television; acquainting the public with the program and work of the Corporation; the creation of a favorable "corporate image;" the interaction of the Corporation with public bodies and officials at all levels of government; the preparation of speeches and articles for the officers of the Corporation; the management of the advertising programs of the Corporation; the preparation of all publicly circulated written or audio-visual materials that deal with the Corporation and its work, and other related activities.

The public is not yet familiar with efficient, sanitary and attractive methods of solid waste disposal. In many localities, city dumps, roadside dumps, creek beds and other dumps continue to exist. Demonstrating the advantages of the sanitary landfill method of solid waste disposal constitutes one phase of the educational program of the Corporation.

In addition, the Corporation can serve as a regional center for both education and training in solid waste collection and disposal and in the relationship between solid waste problems and environmental health. As an intermediary between government and private industry, the Corporation can take advantage of a variety of assistance programs. By carrying out a full range of activities–education, operational training, solid waste collection and disposal, the Corporation could become a catalyst to stimulate regional interest in the development of solutions to solid waste disposal problems.

As part of its educational work, the Corporation will provide technical guidance to communities and counties throughout the Bluegrass Area Development District. This technical assistance will be provided within the Kentucky Program Development Office's Area Development Districts and will be coordinated with existing organizations such as the Blue Grass Regional Comprehensive Health Council.

As the Corporation's operational abilities improve, operational techniques training programs will be developed in conjunction with university, state, and federal agencies. In this way, the Corporation will act as a training center for individuals who will be able to provide more efficient services to their respective areas.

Office of Research and Investigations

It will not be necessary to open this office until the Corporation's operations are well under way and the need to keep abreast of the latest developments in solid waste disposal becomes manifest.

This office, supervised by a director, when it becomes fully operative, will include a library; a laboratory for the study of the composition, properties, reactions, and other characteristics of solid waste; an experimental and investigational staff which will investigate and test new methods and equipment; and experiments in the development of new and improved methods and techniques of solid waste disposal. The library will maintain and keep up to date a collection of books and periodicals on solid waste disposal for the benefit of the research and investigational staff, other employees of the Corporation, interested individuals and the public.

In addition, this office will maintain an advisory and consultative service in the BGADD at the disposition of public and private agencies engaged in the solid waste disposal business, or contemplating entry into this field. The director of this office will maintain such a professional and technical staff as the work load indicates. He will participate in meetings and cooperate with other firms and agencies in his field to keep abreast of new developments and technology as well as to present the results of his findings. The principal objective of his office will be to advance the science and art of solid waste disposal.

Office of the Treasurer

The treasurer of the Corporation has four principal functions: the management of financial affairs for the Corporation and responsibility for an accounting department, a statistics department, and the Corporation's purchasing activities.

Management of Financial Affairs

The treasurer is the principal financial and fiscal officer of the Corporation and is responsible for managing the financial aspects of the Corporation's activities. This includes the management of the cash position; the procurement of the requisite long- and short-term capital for current operations and future expansion; the Corporation's investment program; its financial relations with other public and private agencies and firms; the management of the Corporation's tax liability and its relations with tax authorities.

The Accounting Department

All of the Corporation's financial records are maintained by this department. It supplies the basic data for the determination of the Corporation's price policies. This department also maintains financial records required by law or regulation.

Statistics Department

Under the supervision of the chief statistician, this department gathers and files economic reports and statistics on solid waste disposal and related subjects as well as those dealing with the national and Kentucky economies. It tabulates, reports and studies data generated by the accounting department and other operations of the Corporation.

In addition, it provides economic and statistical information and advice to the corporate management. This department also supplies information and data to the director of the Corporation's public relations and education for reports and materials issued by this office.

Purchasing Agent

This office, responsible for all of the purchases of the Corporation, is under the direction of the corporate purchasing agent. It maintains files of catalogs, price lists, and specifications of various types of equipment, supplies and materials utilized by the Corporation and advises the purchase of supplies and equipment. It also reports on new developments in materials and equipment used by the Corporation.

Corporate Advisory Services

In addition to the line and staff functions presented in the preceding sections, the Corporation needs two advisory services: a legal counsel and an advisory counsel. The functions of these two services are attached to both the chairman of the board and the president and will be used by either or both of them as circumstances dictate.

Legal Counsel

This Corporation probably will not be of sufficient size to warrant the employment of full-time attorney. Nevertheless, it would, from time to time, require the services of legal counsel. It will designate a lawyer or a law firm as its legal counsel. Such legal counsel could be utilized either as a retainer or on an "as utilized" basis, depending upon the volume of legal advice and assistance.

Appendix H

Articles of Incorporation
Bourbon-Harrison-Nicholas
Solid Waste Disposal Corporation

ARTICLES OF INCORPORATION
OF
BOURBON-HARRISON-NICHOLAS
SOLID WASTE DISPOSAL CORPORATION

KNOW ALL MEN BY THESE PRESENTS:

That I, R. K. Wood, a resident and citizen of the Commonwealth of Kentucky, do form a corporation under and in pursuance of the Kentucky Nonprofit Corporation Act, with all the rights, privileges and immunities of a corporation organized for educational, charitable, and public purposes for the promotion of social welfare from which no private pecuniary profit is derived, and do adopt the following Articles of Incorporation.

Article I Name

The name of the Corporation shall be: Bourbon-Harrison-Nicholas Solid Waste Disposal Corporation by which name it may contract and be contracted with; sue and be sued; and carry on business consistent with its purposes and powers.

Article II Duration

The duration of the Corporation shall be perpetual unless dissolved as provided by law.

Article III Purposes

The purposes of the Corporation are to improve the health, welfare, and appearance of Bourbon, Harrison and Nicholas Counties by effecting sanitary disposal of solid wastes through multijurisdictional cooperation and coordination; to cooperate with state, federal, and private agencies toward this end; to foster the education and training of the inhabitants of the above named counties in the proper handling and disposition of solid waste; to eliminate unsanitary or unsightly solid waste dumps and other disposal facilities; and to provide for the improvement and beautification of lands devoted to solid waste disposal.

Article IV Registered Office

The registered office and principal place of business of said Corporation shall be: Bourbon County Courthouse, Main Street, Paris, Kentucky 40361. The name and address of the person upon whom process may be served are: John Butler, 260 Eastridge Drive, Paris, Kentucky 40361.

Article V Board of Directors

The affairs and business of the Corporation shall be conducted by a Board of Directors whose membership shall be fixed by the bylaws. The initial Board of Directors will be three (3) in number, and are:

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Name	Address
John Butler	260 Eastridge Drive, Paris, Kentucky
Melvin E. Hampton	Meadow Lane, Cynthiana, Kentucky
William Power	Elm Street, Carlisle, Kentucky

The initial board of directors shall hold office for such period as is specified in the bylaws, and the successor board shall be elected and appointed in the manner and for the terms provided in the bylaws.

The Board of Directors shall have power:

a) To adopt bylaws and to alter, amend or repeal the same and to provide therein for the internal control and management of the Corporation in respect to time and place of meetings; title, number, and terms of officers and employees of the Corporation; and in respect to all other matters pertaining to the management and operation of the Corporation.

b) To establish policies for promoting the purposes of the Corporation and to make provisions for carrying on and conducting the disposition of solid waste and the other activities by the personnel of the Corporation or through contracts with other organizations.

c) To appoint an Executive Committee and such other committees as it may deem desirable to carry out the objectives of the Corporation.

Article VI Powers

In furtherance of the purposes and objects of the Corporation as set forth in Article III, the powers of the Corporation are:

a) To own and operate, directly or by contract with other public or private entities, a public solid waste collection and disposal business, including, but not limited to, sanitary landfills, transfer stations and hauling facilities, rural area and highway containers, and urban collection facilities.

b) To hire, engage, contract with or otherwise arrange with other persons, partnerships, or corporations to perform the operations of and operations related to solid waste disposal, sanitary landfills, transfer stations and hauling facilities, rural area and highway containers and urban collection facilities.

c) To engage in other businesses or activities which will enhance, improve or facilitate the solid waste disposal programs mentioned herein or which may be related to these operations.

d) To acquire by purchase, lease, option or otherwise, lands and improvements thereon; to erect buildings and construct roads on land owned by it and others; to sell, mortgage or to otherwise dispose of such lands, improvements and roads, to take by devise, bequest, gift, or grant-in-aid from all parties public and private, real and personal property, absolutely or as an agent or trustee, to hold, develop, improve, manage, and administer such properties; to acquire rent, lease or hire and to dispose of, by any lawful means, any and all personal property essential to or related to these ends.

e) To enter into contracts and to employ such persons as may be necessary to further and carry out these ends; to sue and be sued; to have a corporate seal.

f) To borrow money and to give its notes or other obligations thereof and to secure payment thereof by pledging or mortgaging any property, real or personal, it may own.

g) Without limits, as herein stated or otherwise, to do and perform all acts and to have the general powers as set forth in KRS Chapter 273 necessary or convenient to effect any or all of the purposes for which the Corporation is organized.

h) The foregoing purposes and powers shall be construed both as objectives and powers and it is hereby expressly provided that the foregoing accumulation of specific powers shall not be held to limit or restrict in any manner the general powers of this Corporation; and they are in furtherance of and in addition to, and not in limitation of, the general powers conferred by the laws of the Commonwealth of Kentucky.

Article VII Exemption from Liability

The director, officers and employees of the Corporation shall not, as such, be liable on its obligations.

Article VIII Capital Stock

The Corporation shall have no capital stock. No dividend shall be paid and no part of the income or profit of the Corporation shall be distributed to its members, directors, or officers except as reasonable compensation for services rendered.

Article IX Dissolution

In the event of dissolution of the Corporation, all liabilities and obligations shall be paid, any assets accepted and held by the Corporation upon condition requiring return upon dissolution shall be so returned, and any assets remaining shall be distributed in accordance with a plan of distribution adopted by the Board of Directors pursuant to the Kentucky Nonprofit Corporation Act.

Article X Special Provisions

The Corporation shall publish an annual report summarizing its functions and activities and accounting for all funds received and expended. The annual report shall be available to the public and will include a detailed balance sheet and operating statement. No part of the corporate activities shall consist of carrying on propaganda or otherwise attempting to influence legislation, or participating or intervening in any political campaign on behalf of any candidate for public office.

Article XI Amendment

These articles may be amended at a meeting of the Board of Directors upon receiving the vote of a majority of the directors in office.

Article XII

The name and address of the incorporator are as follows:

R. K. Wood, Bowman's Mill Road, RR No. 1, Lexington, Kentucky 40503

IN TESTIMONY WHEREOF witness my hand this 27th day of January, 1971.

R. K. Wood

STATE OF KENTUCKY)
) SCT.
COUNTY OF FAYETTE)

I, a Notary Public in and for the State and County foresaid, do hereby certify that the foregoing Articles of Bourbon-Harrison-Nicholas Solid Waste Disposal Corporation, a Kentucky corporation, were this day produced before me in said State and County and were thereupon acknowledged by R. K. Wood to be his free and voluntary act and deed for uses and purposes set out therein, all of which together with this, my Certificate, is hereby certified to the Secretary of State of the Commonwealth of Kentucky and to the Clerk of the Bourbon County Court, Paris, Kentucky.

My Commission expires March 25, 1974.

WITNESS MY HAND and official seal of office this 27th day of January, 1971.

Notary Public

THIS INSTRUMENT PREPARED BY;

Robert K. Wood
Attorney at Law
Lexington, Kentucky

Appendix I

Bylaws of
Bourbon-Harrison-Nicholas
Solid Waste Disposal Corporation

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BYLAWS
of
BOURBON-HARRISON-NICHOLAS
SOLID WASTE DISPOSAL CORPORATION

ARTICLE I. OFFICES

The principal office of the Corporation in the State of Kentucky shall be located in the County of Bourbon. The Corporation may have such other offices within the State of Kentucky as the Board of Directors may determine.

ARTICLE II. MEMBERS

The Corporation shall have no members.

ARTICLE III. BOARD OF DIRECTORS

Section 1. **General Powers**. The affairs of the Corporation shall be managed by its Board of Directors.

Section 2. **Number, Members, and Tenure**. The initial Board of Directors shall hold office until successor directors have been designated and elected as set out in these Bylaws. The Board shall consist of ex officio members and elected members. The ex officio members shall number not less than four (4) and shall consist of:

One (1) designee of the legislative body of each city participating in the waste disposal operations of the Corporation or maintaining on file with the corporate secretary a current letter of intent to participate in said operations of the Corporation;

One (1) designee of the legislative body of each county participating in the waste disposal operations of the Corporation or maintaining on file with the corporate secretary a current letter of intent to participate in said operations of the Corporation; and

One (1) designee of the Chairman of the County Health Departments of Bourbon, Harrison and Nicholas Counties.

The elected members shall consist of:

Three (3) or more persons, the total number not to exceed the number of ex officio directors, to include at least one person from each of the following groups:

(a) solid waste contractors participating in the operations of the corporate disposal system;

(b) citizens-at-large representing residential users of the system; and

(c) citizens-at-large representing business and industrial users of the system.

A nominating committee of ex officio directors shall prepare a slate of persons having agreed to serve as elected directors, which persons shall be invited to each annual meeting at which time they shall be elected by a simple majority vote of the ex officio directors.

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The term of each director shall begin at the first annual meeting of the Board. Ex officio directors designated by cities or counties may take office at any time upon compliance with the requirements set out hereinbefore. The term of each director shall end at the next annual meeting. Directors for the following year shall be designated and elected as hereinbefore set out. Only those ex officio members designated prior to the time of each annual meeting shall be eligible to vote for the elected members. All letters of intent shall be renewed and filed within ten (10) days prior to each annual meeting. Any vacancies occurring in the elected board positions shall be filled by the vote of the ex officio members, and such replacement directors shall serve for the unexpired term of his predecessor in office. Any director may succeed himself and may be designated or elected for any number of terms.

Section 3. **Chairman of the Board.** A Chairman of the Board shall be elected by the Board. The Chairman of the Board shall preside at all meetings of the Board of Directors, and perform such other duties as may be provided for by these Bylaws or the Board of Directors. In the absence or disability of the Chairman, a temporary Chairman shall be selected by the members present and shall preside at meetings of the Board, and shall in addition perform such other duties as may be imposed upon him by these Bylaws or by the Board of Directors.

Section 4. **Annual Meeting.** The annual meeting of the Board of Directors shall be held the month of March of each year upon the notice set out in these bylaws.

Section 5. **Regular Meetings.** Regular meetings of the Board shall be held at least semiannually in February and August of each year. The Board of Directors may provide by resolution the time and place for the holding of additional regular meetings of the Board without other notice than such resolution.

Section 6. **Special Meetings.** A special meeting of the Board may be called by the Chairman of the Board upon the written request of a majority of the members.

Section 7. **Notice.** Notice of any meeting of the Board of Directors shall be given at least ten (10) days in advance thereof by written notice delivered personally or sent by mail or telegram to each Director at his address as shown by the records of the Corporation. If mailed, such notice shall be deemed to be delivered when deposited in the United States mail in a sealed envelope so addressed, with postage thereon prepaid. If notice be given by telegram, such notice shall be deemed to be delivered when the telegram is delivered to the telegraph company. Any Director may waive notice of any meeting. The attendance of a Director at any meeting shall constitute a waiver of notice of such meeting, except where a Director attends a meeting for the express purpose of objecting to the transaction of any business because the meeting is not lawfully called or convened.

Section 8. **Quorum.** A majority of the Board of Directors shall constitute a quorum for the transaction of business at any meeting of the Board.

Section 9. **Manner of Acting.** The act of a majority of the Directors present at a meeting at which a quorum is present shall be the act of the Board of Directors.

Section 10. **Informal Action by Directors.** Any action required by law to be taken at a meeting of Directors, or any action which may be taken at a meeting of Directors, may be taken without a meeting if a consent in writing, setting forth the action so taken, shall be signed by all of the Directors.

Section 11. **Remuneration of Directors.** Directors shall not receive pay for their services.

ARTICLE IV. OFFICERS

Section 1. **Officers**. The officers of the Corporation shall be a President, a Secretary, a Treasurer, and such Vice Presidents as the Board may deem desirable. Such officers shall have the authority to perform the duties prescribed from time to time by the Board of Directors. Any two of the offices of Vice President, Secretary, and Treasurer may be combined in one person. The Board of Directors may establish such other offices as in their judgement the Corporation shall require and shall make or authorize appointments to such offices.

Section 2. **Election and Term of Office**. The officers of the Corporation shall be elected at the annual meeting of the Board. If the election of officers shall not be held at such meeting, such election shall be held as soon thereafter as conveniently may be. New offices may be created and filled at any meeting of the Board of Directors.

The Board of Directors is authorized to enter into employment contracts with the President or other officers for such term and upon such conditions as the Board in its discretion shall deem advisable.

Section 3. **Removal**. Any officer elected by the Board of Directors may be removed by the Board of Directors whenever in its judgement the best interests of the Corporation would be served thereby, but such removal shall be without prejudice to the contract rights, if any, of the officer so removed.

Section 4. **Vacancies**. A vacancy in any office because of death, resignation, removal, disqualification, or otherwise, may be filled by the Board of Directors for the unexpired portion of the term.

Section 5. **President**. The President shall be the chief executive officer of the Corporation, and subject to the direction of the Board of Directors and the Executive Committee, shall generally supervise and direct the affairs of the Corporation; shall make such reports to the Board of Directors and to the Executive Committee as he may deem necessary, or shall be required by these Bylaws or by said Board of Executive Committee; shall have power to employ, remove, and suspend all agents and employees, to determine the duties and responsibilities of such agents and employees, to create such titles for such agents and employees as may be regarded as desirable to enable the agents and employees to execute their duties and responsibilities, and to fix and change the compensation of such agents and employees; shall sign and countersign all contracts and other instruments of the Corporation authorized by the Board of Directors or the Executive Committee; shall do all other things not expressly provided for and not prohibited by these Bylaws necessary or proper to accomplish any of the objectives or effectively exercise any powers specified in this Section; and shall perform such other duties and exercise such other powers as may be imposed upon him or authorized from time to time by the Board of Directors or by its Executive Committee.

Section 6. **Vice President**. The Vice President, in the absence or disability of the President shall perform the duties of the President and such other duties as may be assigned to him.

Section 7. **Secretary**. The Board of Directors shall elect a Secretary of the Corporation. The Secretary shall keep in books belonging to the Corporation the minutes of the meetings of the Board of Directors and the Executive Committee. The Secretary shall have custody of the seal and corporate minute books; shall sign with the President instruments requiring his signature; and shall make such reports and perform such duties as are incident to his office or are required by these Bylaws or which may be required of him by the Board of Directors.

Section 8. **Treasurer.** The Board of Directors shall elect a Treasurer of the Corporation who shall be responsible for verifying and certifying financial reports and records of the Corporation and such other duties and responsibilities as may be assigned to him by the Board. He shall make an annual public report on all funds received and expended by the Corporation.

ARTICLE V. COMMITTEES

Section 1. **Executive Committee.** By resolution adopted by a majority of the Directors in office, the Board may designate and appoint from its members an Executive Committee consisting of at least two directors including a Chairman of the Executive Committee. The Chairman shall preside at all meetings of the Executive Committee. In the absence or disability of the Chairman, a temporary Chairman shall be selected by the committee members present, and he shall act for the purpose of the meeting as Chairman of the Executive Committee. The Executive Committee shall have full authority to act for and on behalf of the Corporation and to take any and all action within the power of the Board of Directors except as limited by the Articles of Incorporation or KRS 273.221. The Executive Committee shall report to the Board of Directors any and all action taken by it at the next regular or special meeting of the Board. The Executive Committee shall meet at least every quarter on call of the Chairman of the Executive Committee.

Section 2. **Other Committees.** Other committees not having and exercising the authority of the Board of Directors in the management of the Corporation may be appointed in such manner as may be designated by a resolution adopted by a majority of the Directors present at a meeting at which a quorum is present. Members of other committees need not be members of the Boards of Directors.

Section 3. **Term of Office.** Each member of a committee shall continue as such for the term provided in the resolution creating the committee and until his successor is appointed.

Section 4. **Committee Chairman.** One member of each committee shall be appointed chairman by the person or persons authorized to appoint the members thereof.

Section 5. **Vacancies.** Vacancies in the membership of any committee may be filled by appointments made in the same manner as provided in the case of the original appointments.

Section 6. **Quorum.** Unless otherwise provided in the resolution of the Board of Directors designating a committee, a majority of the whole committee shall constitute a quorum and the act of a majority of the members present at a meeting at which a quorum is present shall be the act of the committee.

Section 7. **Rules.** Each committee may adopt rules for its own government not inconsistent with these Bylaws or with rules adopted by the Board of Directors.

ARTICLE VI. BOOKS AND RECORDS

Section 1. The Corporation shall keep correct and complete books and records and shall also keep minutes of the proceedings of its Board of Directors and its Executive Committee. The books and records of the Corporation may be inspected by any Director for any proper purpose at any reasonable time.

ARTICLE VII. SEAL

The Board of Directors shall provide a corporate seal, which shall be in the form of a circle and shall have inscribed thereon the name of the Corporation and the words "Corporate Seal."

ARTICLE VIII. FISCAL YEAR

The fiscal year of the Corporation shall begin on the first day of July and end on the last day of June in each year.

ARTICLE IX. INDEMINIFICATION OF OFFICERS AND DIRECTORS

Section 1. Each Director and officer of the Corporation or his personal representative shall be indemnified by the Corporation against claims, liabilities, expenses, and costs actually and necessarily incurred by him or his estate in connection with, or arising out of, any action in which he is made a party by reason of his being or having been an officer or Director, except in relation to matters as to which he shall be adjudged in such action to be liable for actual negligence or misconduct in the performance of his duties as such Director or officer.

Section 2. The right of indemnification herein provided for shall also apply in respect of any amount paid in compromise of any such claim asserted against such officer or Director (including expenses and costs actually and necessarily incurred in connection therewith), provided the Board of Directors of the Corporation shall have first approved such proposed compromise settlement and determined that the Director or officer involved was not guilty of actual negligence or misconduct; but in taking such action any Director involved shall not be qualified to vote thereon.

ARTICLE X. CONFLICT OF INTEREST

Any Director or member of his family having or intending to have a direct or indirect financial interest in any matter coming before the Board shall promptly disclose such interest to the Board and, shall not participate in any discussions or voting on any such matters, as directed by the Board of Directors.

ARTICLE XI. AMENDMENTS TO BYLAWS

These Bylaws may be altered, amended, or repealed, and new Bylaws may be adopted by the Board of Directors at any regular meeting or at any special meeting, if at least ten (10) days written notice is given of intention to alter, amend, repeal, or adopt new Bylaws.